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*Helena, Mont.*

THE GETTY CENTER LIBRARY

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When we have the stars?

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# CARPENTRY AND BUILDING.

VOL. V.—1883.

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# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

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## A Study in Suburban Architecture.*

BY AN ARCHITECT.

### Selecting a Plan.

It has been said that a woman will always have the last word. This is true, and sometimes she has the first also. Mrs. Archie, having taken the floor, discoursed as follows: "Four weeks have elapsed since your first sketches for our house, which, by the way, were not at all satisfactory. The more I examine them the more positive I am of the fact. What is the matter with them? I will tell you. Beginning with design No. 4, which is perhaps the best, I will admit that the reception-room, hall, parlor and sitting-room *en suite* is a very elegant affair; that the parlor would furnish superbly; that the vestibule is roomy, impressive and well lighted. Beyond this I have no patience with your designs. Beginning at the entrance, I should certainly not have a coat-room opening from the vestibule. You might as well have it outdoors at once. The staircase is poor—worse than in any of the other designs. The hall is not any too well lighted, which in No. 3 is managed much better. The dining-room is very poorly placed. Why? Because it will never receive the eastern sun. My dining-room must have the glorious morning sun. No sun, no dining-room; no dining-room, no house. My objection applies to the dining-room in all four of the plans, and for an architect's house such an arrangement is quite inexcusable. The kitchen is spacious, but badly lighted. One cannot see to cook in a corner, and the stove is too near the passage to the reception-hall, which, by the way, is not well separated from the kitchen. The windows are all in one side of the room, and the cook must first hang over the stove, and then out of the window for a breath of air. The working corner in the kitchen is good, and there is some sense in the entry with its steps up to kitchen and down to cellar. Steps inside are better than steps outside; they will not be icy in winter." While all this talk has been going on I have not been idle. My drawing-table has been wheeled into the center of the room, a sheet of paper tacked down, and everything made ready for the work.

"Oh," said Mrs. Archie, "I see that my arguments are unanswerable. Then set to work at once. Of course I can't tell you *how;* but, *somehow*, make a plan that is better to live in and better suited to our lot." And so we set about it in good earnest. After several evenings' sketching and rubbing out, and of turning and twisting our allotment of rooms about on the board, we arrive at the following arrangement:

A spacious hall, well lighted, not only from the windows on the stairs, but by windows at the front, from which we can observe the approach to the porch, and in the alcove can be accommodated quite a party well seated for conversation. The stairs have a recess of their own, and do not encroach upon the hall-room either on floor or ceiling. The

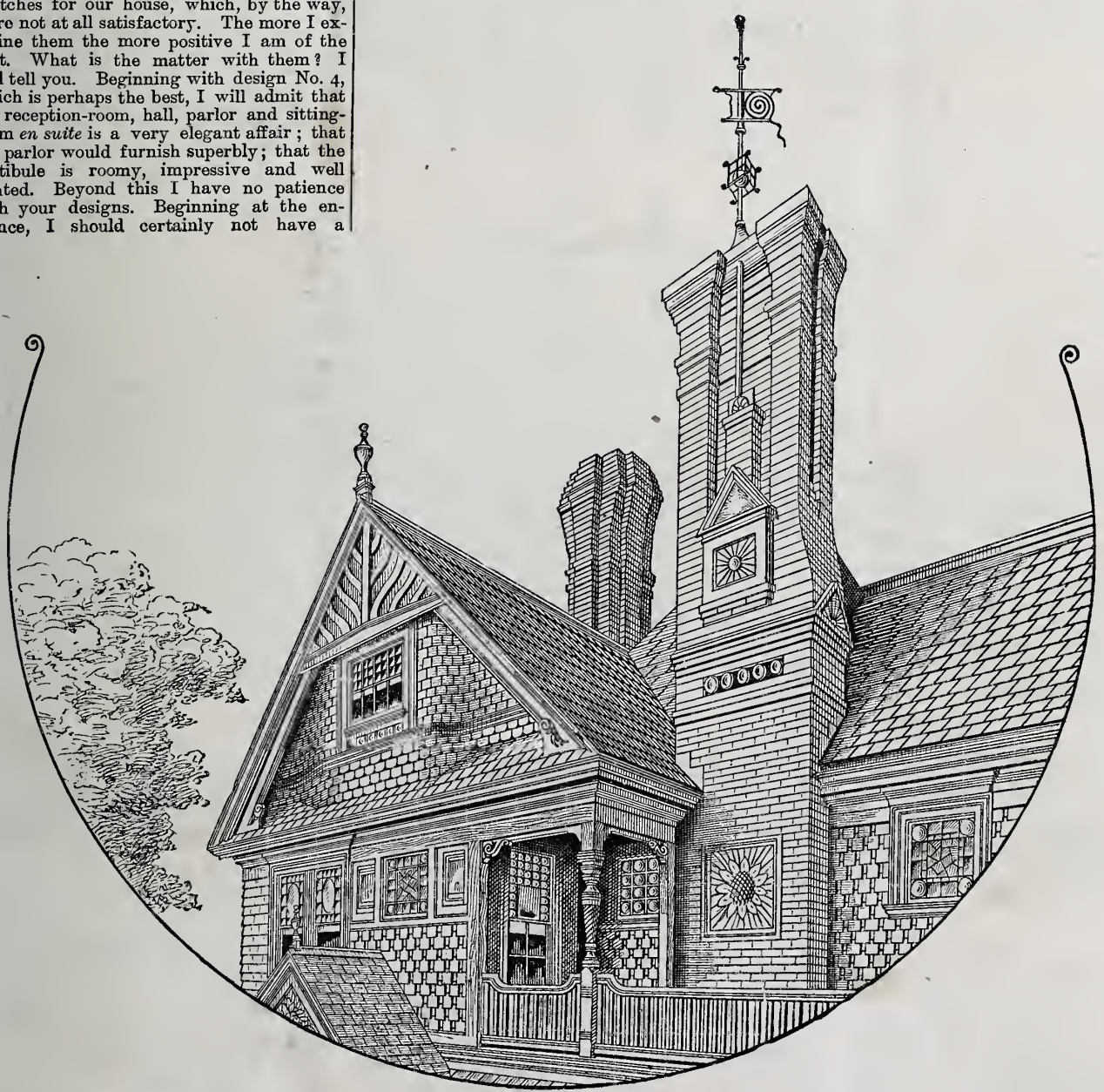


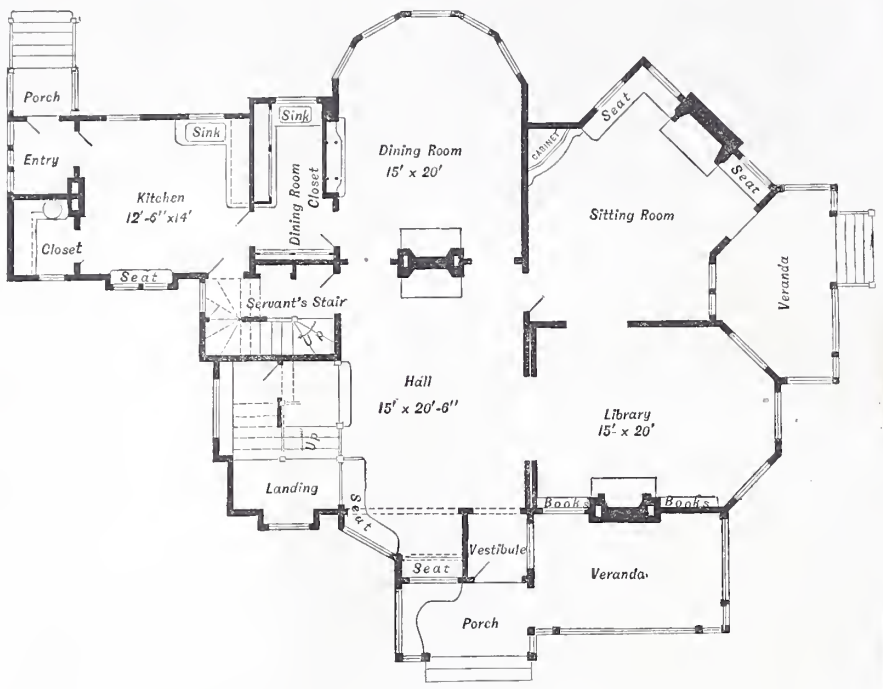
*Fig. 1.—Perspective View, Front Gable and Chimney.*

A STUDY IN SUBURBAN ARCHITECTURE. BY AN ARCHITECT.

* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.

word parlor we have stricken out, and have the library instead, with the books so placed that one has hardly to rise from his chair by the fire to select his favorite volume.

The sitting-room shows no attempt at balance. We care not how "crooked" it is. We shall have the benefit of all the light there is, and the shade of the veranda if we wish. The large, open fireplace is placed where it should be—where we can sit and look across the country, and of a winter evening, when darkness settles down upon the landscape at an early hour, and we are




*A Study in Suburban Architecture.—Fig. 2.—First Floor Plan.*

wating for our tea, we can watch the lights as they flash out one by one as if by a magic touch, until the spot where lies the great city is as a galaxy of stars. Mrs. Archie has very little to say, for the dining-room has not only an eastern aspect, but a southern and western also. The kitchen is not dark, and the windows are in opposite walls. The chimney is beyond the influence of drafts from the main house. The servants' stairs are central, without being in the way, and one is not obliged to pass through the kitchen to find them if he chooses to go up that way. We do not feel that all things are positively perfect in this plan, but we feel encouraged to draw the second-floor, and to think of the elevations.

Our second floor is arranged round a central hall, and the open fireplace is again presented. This hall is to be used as a sitting-room on those howling, stormy winter evenings when no one is abroad, company is not expected, and we want to get away from the noise of the storm. Here we are almost in the center of the house, before a cheerful fire, and no need of drawing curtains to shut out the blackness of the night.

Opening from this hall is our studio, where Mr. Archie can work out a problem now and then with his family in sight, and often, perhaps, receive a timely suggestion.

The bath-room is entered from a passage running between the family chamber and the nursery, so that by shutting one door the *suite* is complete. No plumbing is to be carried into the main part of the house, with the exception of water to the bowl under the front stairs. Several good attic rooms can be obtained, but their arrangement will be governed somewhat by the style of elevation, to which we will now turn our attention. A day or two ago the Doctor called to me over the fence:

"So they tell me you are going to build for yourself. Well, perhaps you don't want any advice, but if you'll listen to me you'll leave your Queen Anne, and your Elizabethan, your Jacobean, and all other early gig-gogery, and stick to the plain American style. Save your jimcracks for your clients. They can afford to pay for 'em. Gravel roof's good enough for me, and you, too."

But, alas, good Doctor, we have another neighbor, whose advice is so much more to our minds that we are inclined to act upon it at once. She says, "I don't care how you arrange the rooms, so that you think them comfortable and to your own liking; but remember that your land adjoins mine and I shall soon build, and I must have an artistic house to look at from my eastern windows. So let us have all the surprises you can. Don't for the world give any one to understand by the front elevation that he has seen the whole house. Verandas are good, but don't continue them entirely around the house. Let every room have a window or two—not shut out from the sun. Let a walk round the house lead to a succession of surprises. An uneven balance is good—a shooting up here and a sliding down there—all, of course, indicating of themselves the arrangement of the interior. Now, do be good, and build something beautiful for me to look at. Perhaps you don't *care* for advice, but I shall recompense you by allowing *you* to advise *me* when *I* build."

Our elevation has been designed with some reference to the above advice, but not without a certain plainness of detail, as we shall find further on. Our argument is, that the first and most lasting effect to the eye is the general outline of the house, and its ability to suggest the uses of the rooms they cover. After that, certain recesses and projections, not covered, but so placed as to emphasize the whole, and then a careful study in color.

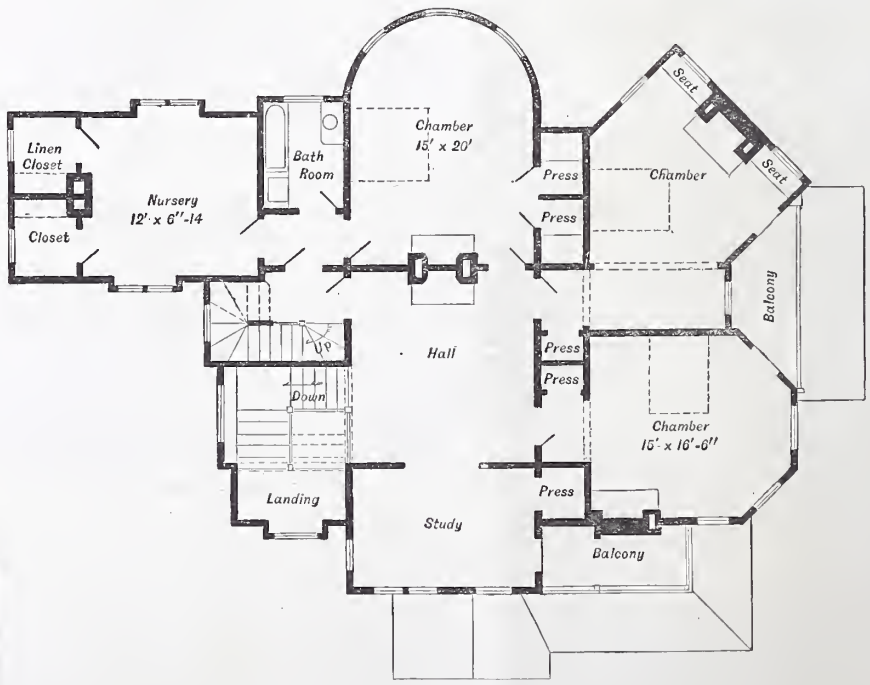



*Fig. 3.—Second Floor Plan.*

## NEW PUBLICATIONS.

SHORING AND UNDERPINNING. By C. Hadem Stock; 54 pages; illustrated with 10 full-page plates; size 5½ by 3¾ inches. Published by B. T. Batsford & Co., London, England.

The object which Mr. Stock had in view in presenting this work was to supply a want that has been for some time felt among many members of the architectural profession. It has been impossible hitherto to get the subject of shoring and underpinning, whether as a necessary part of the education of an architect or for an examination, without a prolonged search in different libraries for the scraps of information on the subject, scattered about among the works of various authors. The difficulty of obtaining information in this way has also been considerably increased by the fact that some of the best authorities on the subject write in a foreign language, and consequently the student has been obliged at a sacrifice of time to fall upon the expedient of sketching and measuring existing cases. This, Mr. Stock considers as an admirable method in its way, but one which would be more interesting and instructive if some previous knowledge of the subject had been acquired. In the work here considered, he has accordingly presented a careful collection of all the authorities, together with a few additional notes and sketches made from actual experience with the work.

Shoring and underpinning of the towers, columns and arches of a number of old churches and buildings that have succumbed, after having served their purpose well for many years, is a subject perhaps too wide and complicated to be thoroughly investigated in a text-book of the kind here considered, and only a few examples and methods are therefore described in the work. It should, however, be stated in this connection that each case requires to be treated in its own peculiar way, and it is therefore practically impossible to lay down any fixed rules or to prescribe any particular methods by which shoring and underpinning may be successfully carried out in any case. In the more general cases of shoring and underpinning, where one structure is so much like another in its purpose and construction, it is possible, to a greater or less extent, to prescribe methods which will answer as well in one case as in another, and it has been the aim

of tho author in his work to explain such methods and the rules involved in them. The work throughout is provided with numerous engravings, illustrating the different methods to be pursued in carrying out works of different kinds, and these, together with the accompanying descriptions, will be found to give very valuable information on the subject considered. Shoring and underpinning and dealing with ruinous and dangerous structures is one of the subjects that should be thoroughly understood in architectural circles, and the work in question, having been very carefully compiled, is therefore well worthy of study.

SOME DIFFICULT PROBLEMS IN CARPENTRY AND JOINERY SIMPLIFIED AND SOLVED BY THE AID OF THE CARPENTER'S STEEL SQUARE. By Fred. T. Hodgson. 48 pages; pamphlet form; published by the Industrial Publishing Co.: price. 25 cents.

This the fifth volume of the series entitled "Work Manuels," some of the earlier issues of which we have already noticed. The volume commences with a description of the steel square, explaining all the scale lines and figures on the blade and tongue, with directions how to use in every-day work. The cuts and much of the matter are similar to that in a former work by the same author, entitled "The Steel Square and Its Uses," with which our readers are already familiar.

*A Study in Suburban Architecture.—Fig. 4.—Front Elevation.*

We notice very little change in this volume from the one just mentioned, and judge that the idea of the publishers has been to put out a cheaper edition of the former work. As this has only a part of what was contained in the former work, we think a mistake has been made, for certainly no one would begrudge 75 cents for a work explaining such a useful tool as the steel square. The present volume is dedicated especially to young mechanics, and the author directs attention to the fact that he has not intended it to supersede the larger work to which we have already referred.

HOW TO KEEP A STORE. By Samuel H. Terry. 406 pages, 5 by 7½ inches in size. Published by Fowler & Wells. Price $1.50.

The author says, in his title-page, that this work embodies the conclusions of 30 years' experience in merchandising, and, in his introduction, that the book is mainly intended as a text-book on the art of buying and selling goods at retail. We think he has done well what he set out to do, namely, to gather together his own experience and that of his circle of acquaintance and condense it all into a form that will be useful to those starting out in business life. We have gone through the book with considerable care, and we heartily wish that we could put it into the hands of every one of our friends in the retail business, with the knowledge that they would read it from beginning to end. Its careful, conscientious and sound advice on almost every point and principle involved in the retail business is so clearly put as to be worthy of the highest praise. There are chapters devoted to the selection of business; on the choice of locality for business; on buying a stock; obtaining credit; marking and arranging goods; advertising; employment of clerks; the art of selling goods; selling for cash; credit; cash and credit combined, and an especially interesting chapter on the replenishing of stock, to which every retailer ought to give careful attention. Other chapters are devoted to settling for purchases; on the depreciation of goods; loss by fire, theft, neglect, &c.; keeping accounts; expenses; copartnerships; on buying goods at auction; investment of profits; insolvency, as well as many others. Many of the chapters treat upon subjects to which very few retailers have given a thought, while others bring out clearly rules for guidance that are generally lost sight of. The book is a little storehouse of advice, to which both the experienced and inexperienced dealer may go for a thousand things entirely inaccessible elsewhere.

MANUAL OF SCREW CUTTING. By William Simpson. 15 pages, 5½ by 3½ inches.

This little handbook is intended to give the workman, in small compass, rules for calculating the change gear on screw-cutting lathes, to cut square and angular threads per inch or per pitch with two or four gears. There is also much other information relative to screw cutting, the author's object being evidently to give simple methods for finding change gears to cut any possible thread per inch. Examples are given under each rule, and a simple nomenclature used in order to lessen the amount of verbiage. Tables for United States standard screw threads, as well as Whitworth's, are also given.

## NOTES AND COMMENTS.

The Minneapolis flour explosions, which many of our readers will remember, were, we think, the first which called attention to the inflammable and explosive quality of flour dust. Recently some explosions in mills have called further attention to this subject. Mr. William Cordes, member of the Engineers' Club of St. Louis, called attention some time ago to a method of making dust explosions less destructive, which was in use in some of the Western mills. The plan is simply to make the dust-room of the lightest possible material, and place it at some distance from the more solid structures. In the case of fire, when the room is thus made, the walls are blown outward and the explosion is comparatively light, doing no damage. It is indeed very much like burning gunpowder in the open air. There is much noise and smoke, but the projective force is small. This is, in fact, adopting the recommendations made by McAdam and Rankin in 1872.

That the electric light for street illumination has come to stay is pretty certain. Travel where one will, electric street-lamps meet the eye. Even in the smaller towns they are found here and there, and their superior power over the largest sizes of gas burners is very marked. In the city of Boston there are several street gas burners of unusual size and brilliancy, yet they do not penetrate the darkness with anything like the power of the electric lights in their neighborhood. That this is so is easily shown by the fact that the electric lights cast long shadows into the immediate vicinity of the gas lamps, while the gas lamps fail to produce any effect, save within a very short distance. We saw on Tremont street a triplet of what we took to be three Sugg slit union burners. The flame seemed to be about 7 inches across, and the light was exceedingly good. Even this did not hold its own with the electric light on the next block, although it was the most brilliant gaslight we have yet seen.

It seems that the architects of the State Capitol, at Albany, Messrs. Eidlitz, Richardson & Olmstead, do not quite agree with the committee who recently reported the Assembly chamber as unsafe. They admit some of the facts, but they show apparently that more facts are needed in order to understand those which were considered. The evidences of settling, they contend, are partly the result of uneven and imperfect workmanship; that part of the settling, no doubt, has taken place, but they have every reason to believe that it has already ceased. They assert that the ribs which have been splintered were splintered during construction, or immediately afterward, and think there is no reason for removing the stone ceiling and replacing it by a wooden construction. Their judgment is that by removing the cracked and shivered stones, and replacing them by sound work, the whole will be firm, and that no further change in the work need be expected, which is certainly a reassuring statement.

That steam pipes are a fruitful cause of spontaneous combustion in wood resting against them has been amply demonstrated on many occasions. A trifling smashing of carved moldings and ceiling boards was all the damage that resulted a short time ago from the discovery of an incipient fire around a pair of steam pipes in the dining-room ceiling of a Hudson River steamboat. Had it occurred in a different place four or five hours later in the night, and been coupled with an uncharged fire extinguisher, the result can better be imagined than described. That extinguishers are not always kept charged is proved by a most notable case which happened in Philadelphia recently, and, as things go, it is fair to expect that extinguishers on boats will not be much better taken care of. In houses heated by steam many fires may be traced to the same cause.

Luminous paint as hitherto made has a yellowish-white appearance in daylight, but a firm in Dresden, Germany, it is said, now produce various paints—pure white, blue, red, green, violet and gray—so that the objects which become luminous at night may have a pleasing appearance by day. The ordinary luminous paint is in use in this country, and some of the leading paint houses have it for sale. As it becomes better known many uses may be found for it.

The work of demolishing the Tuileries Palace, in Paris, France, is meeting considerable and unexpected delay. The matter was brought before the last meeting of the Commission of Historical Monuments, with a view of deciding upon the best measures to be taken to preserve those portions of the building which are interesting from their historical associations or artistic beauty, and a committee was appointed to make choice of the portions of the building which should be preserved.

## Combination Trusses.

The constantly increasing demand upon architects and builders to provide carrying trusses for large openings, both in floor and roof systems, is at present compelling their attention to resorts in construction which a majority of them have hitherto relegated almost entirely to the civil engineer. We therefore think the extracts from a paper read before the Engineers' Society of Western Pennsylvania, by Mr. C. L. Strobel, C. E., of the Keystone Bridge Company, Pittsburgh, Pa., which we publish below, will be found of interest to a large class of our readers. Although Mr. Strobel, in his paper, "Combination Bridges—their Merits and their Cost," refers almost exclusively to the joint application of wood and iron in bridges, the principles involved in this method of construction and the deductions made as to safety, durability and cost are just as applicable to the large floor or roof truss as they are to the bridge truss. We call the attention of our readers particularly to the

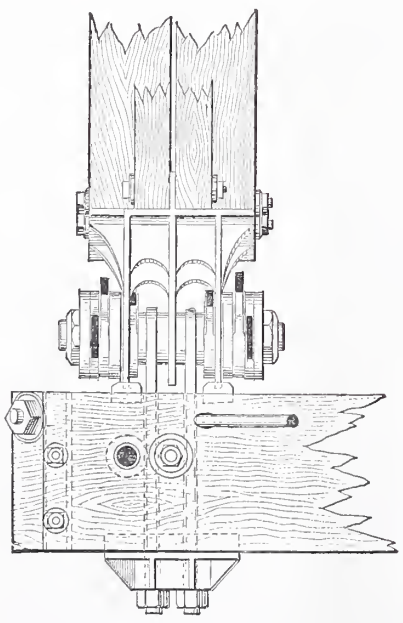


*Fig 2.—Post, Brace and Floor Beam.*

cuts of the details represented in our illustrations, as of great value in leading to a clear understanding of how the connections between the parts of trusses are made in the best modern practice.

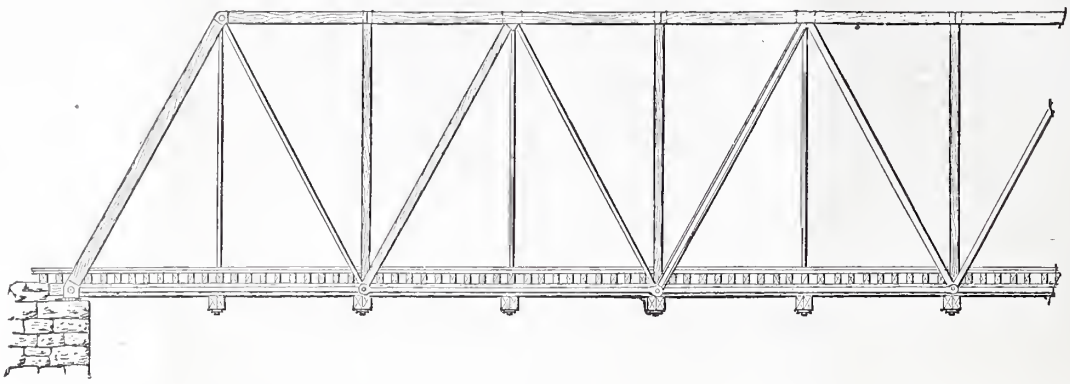
The calculations of cost of the different styles of truss, based as they are upon current market prices, with sources of reference stated, will also prove of great value to those interested in this kind of construction.

Mr. Strobel said: It is my purpose to describe the essential and distinctive features of the combination bridge, and in connection therewith to treat of those properties of timber which have an important bearing upon its use for constructive purposes; to discuss certain truss forms commonly used; and to compare the merits and cost of the combination and the Howe truss bridge. The immediate occasion for these remarks is the conviction that the combination bridge is not as generally known and appreciated as it deserves to be, and that very erroneous opinions prevail as to its cost. While the subject is not a new one, I may claim for it that it has not, so far, received more than passing notice in any published work; and I think the comparative table of cost, which I shall present, will be found to contain results very unexpected to many engineers. The combination or composite bridge owes its name to the use of two materials, wood and iron, conjointly in its construction. The term is, however, applied to only such truss bridges the tension members of which are of iron and the compression members of wood. It does not include the Howe truss bridge, for although those of its web members which are strained in tension—viz., the vertical rods—are of iron, the bottom chord, also a tension member, is of wood; and as the older forms of all wooden bridges, the "Long" and the "Town," have gone out of use altogether, and the Howe truss, of the bridges now built, is more nearly a wooden bridge than any other, it is usually classed as such.

The Howe truss bridge is of American origin, and no doubt more bridges of this kind have been built in the United States to the present day than of any other. It is also well known in Europe, and frequent examples of it are to be met with there. It owes its superiority over the older forms of wooden bridges, which it supplanted, to the use of iron for a portion of its tension members, and, similarly, I shall show that the combination bridge is a better bridge than the Howe truss, chiefly for the reason that all of its tension members are of iron. The combination bridge is not only also of American origin, but it is a bridge which is impossible with European methods of joining the members by means of rivets, and the type is therefore especially peculiar to this country. It furnishes a striking illustration of the capabilities of pin-connections, as used in American iron-truss bridges, and further attests the superiority of these over riveted joints, a superiority which is admitted both constructively and economically by unprejudiced European engineers. The obstacles in the way of the successful employment of wood as a material in bridge construction may be classed under two principal heads—its quality of shrinking in seasoning, and its small shearing strength along the grain. Of minor constructive, though not of less economic, consequence is its perishable nature and the uncertainty within wide limits of its strength.

*Shrinkage of Timber.*—The percentage of shrinkage is much larger across than with the grain. It varies very much for different timbers, nor is there much uniformity for even the same kind of timber or for pieces cut from different parts of the same tree. The following are some of the average values given for European timbers.

| | Along the grain. Per cent. | Across the grain. Per cent. |
|---|---|---|
| Black Ebony | .010 | 3.1 |
| Oak | .2 to .3 | 3.0 |
| Ash | .187 to .821 | 5.7 |
| Pine, Norway Spruce | .076 | 3.3 |
| Cherry (*Prunus avium*) | .112 | 7.3 |
| Mahogany | .110 | 1.4 |
| Poplar, silver | .086 to .629 | 4.5 |
| " black | .125 | 4.3 |



*Combination Bridge with Wooden Floor Beams and Second Compression Brace of Wood.—Fig. 1.—Side View of Half Truss.*

In the Howe truss bridge the braces, through the interposition of cast angle blocks, abut against the under and top sides of the wooden chords, but the rods being adjustable, the shrinkage of the timber is provided for by screwing them up from time to time, and the members are thereby prevented from working loose. No such adjustment was possible in the Long and Town trusses. These invariably became loose and shaky in a short time after they were put up, and this contributed in a great measure to their want of success. Shrinkage along the grain being generally very small, the opinion is quite prevalent that there is none at all in this direction, but the above table shows that it may be as much as 1 inch in 30 feet for oak, and 2 inches in 30 feet for poplar. The fact that shrinkage does take place along the grain should never be lost sight of, though, ordinarily, it is so small that it need not be considered. In the combination truss the timbers abut on end, and shrinkage simply reduces the camber. By calculating the lengths of the wooden members with an allowance for shrinkage, or, as is more generally done, by providing originally a slightly larger camber than is customary in an iron bridge, no inconvenience will be experienced. But in combination as well as wooden bridges, the bolts which pass sidewise through the timber and are used to hold the sticks in position, or to pack them together, including the track bolts through cross-

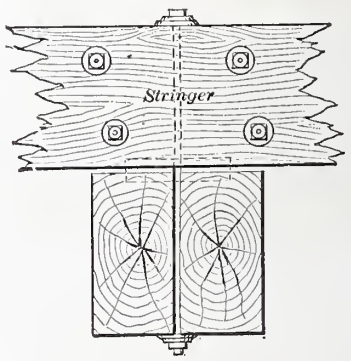



*Fig. 3.—Stringer Connection with Floor Beam.*

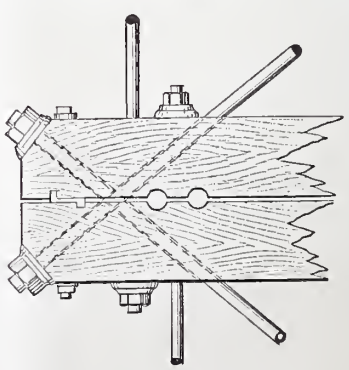
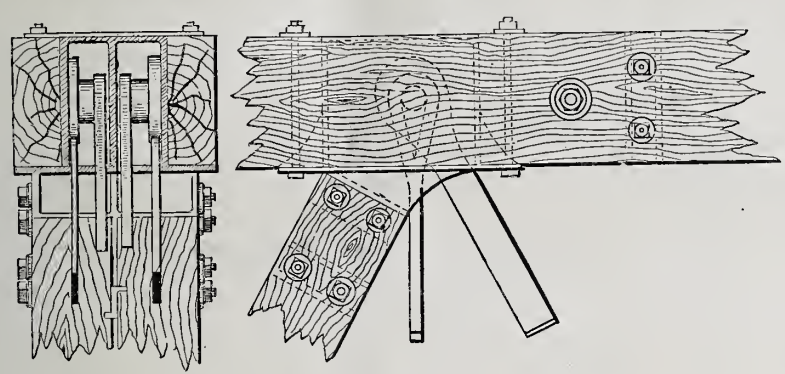


*Fig. 4.—Top View of Floor Beam.*

ties in iron bridges, require screwing up after a time, and where the bolts are in a vertical position the nuts should be locked in some manner, so they will not work off and either the bolt or the nut drop to the ground and be lost.

*Tensile Connections.*—The second great obstacle in the way of the employment of wood in bridge or truss construction is its low shearing strength along the grain, which makes it very difficult, if not impossible, to devise satisfactory tensile connections. In the lower chords of the Howe truss the difficulty is met by providing an excess of timber in the chord sticks, by making them very long, and by keying them together, so that one stick can transfer a portion of its strain to the adjoining stick through the keys and the tubes of the angle blocks. The clamps are then proportioned as only a partial splice for the chord stick, and the stick spliced is not counted in as part of the effective section of the chord. All this entails extra expense, and at best there is so large an element of uncertainty in the effectiveness of the splicing—the intricate course of the stress from one stick to another through the keys, tubes, clamps and bolts is past computation—that the Howe truss is far from satisfying modern demands on a first-class truss, one of which requires the employment of such forms of construction only which admit of the determination of the strain in all parts with precision and certainty.



*Combination Trusses.—Fig. 5.—Detail of Upper Chord and Connection with Second Compression Brace.*

In the combination truss all the timber is used to its best advantage. It is in simple compression, abutting squarely on end against cast-iron shoes. The several sticks forming one member are keyed and bolted together, so as to act in unison. The framing is very simple, more so than in the Howe truss, and long sticks of timber are avoided. Timber exposed to the weather, as is well known, begins to rot first where it is in contact with other timber, because the moisture is retained longest at such points of contact. Hence, cast-iron keys are preferable to wooden ones, and hardwood keys to softwood keys. By using cast-iron keys in combination bridges, wood in contact with wood very seldom occurs, and can be avoided altogether, and it is a matter of comparatively small expense to provide the compression members with sheet iron or tin roofing, and thereby increase the durability of the timber greatly. The center lines of stress intersect at joints in the centers of the pins, avoiding the cross strains from eccentricity which occur in the Howe truss, and all strains are clearly defined and can be calculated with precision. The castings are simple joint boxes, very similar to those used in iron bridges with closed compression members.

The illustrations accompanying this paper represent the well-known Warren or single triangular form of truss. In the Warren truss the middle braces are proportioned to resist both tension and compression, as the position of the load on the bridge may require, but the diagonal members or ties of the Pratt and Whipple trusses are designed to take tension only, and counter diagonals are provided, which take the stress, when the main ties, without their use, would be compressed. It is these counter ties which make the Pratt and Whipple form of truss objectionable for the combination bridge, because they are necessarily subject to excessive strains from temperature.

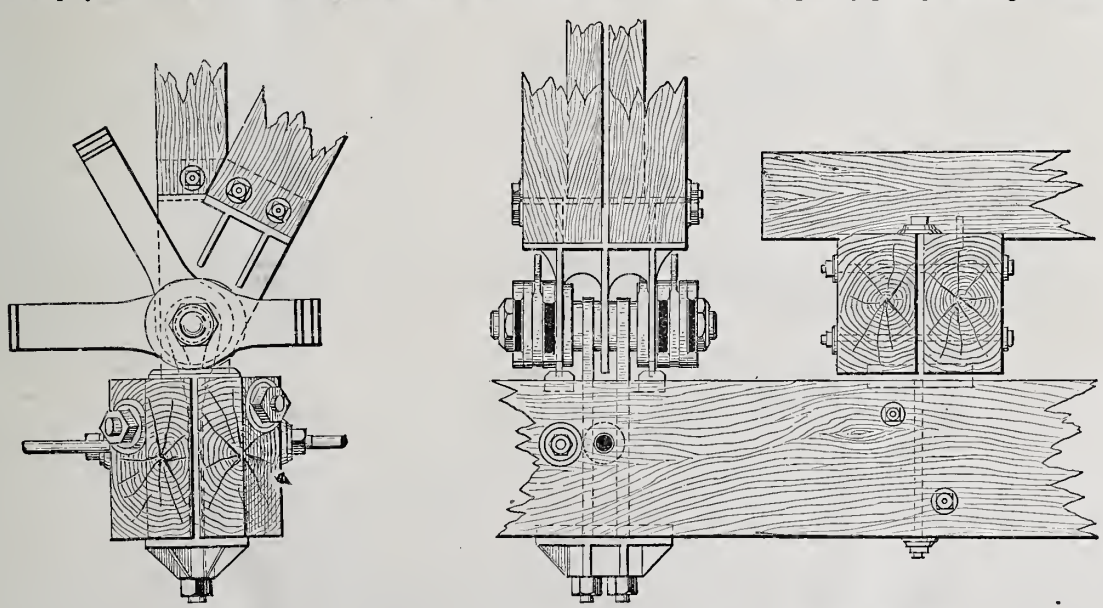


*Fig. 6.—Details of Lower Chord and Floor Beam at Second Compression Brace.*

While the Howe truss is not free from temperature strains, they are not of so serious a character as in the combination quadrangular bridge, since the worst case in the Howe truss corresponds to the middle panel of the combination bridge, where the values of the temperature strains are reduced more than one-half. In the combination bridge of the Warren type, those braces near the middle of the truss which are subject to both tensile and compressive strains should always be made of iron. The truss will then be free from temperature strains. Owing to the differences in the expansion of the iron and wood members, the trusses will assume a slightly greater camber in winter than in summer, and in consequence of the shrinkage of the timber in seasoning, they will settle down to a somewhat smaller than the original camber after the timber has had time to dry; but none of these slight changes in length will create strains, since the truss is free to accommodate itself to them.

The illustration represents a combination bridge with wooden floor beams and the first and second braces of wood—*i. e.*, all those truss members of wood which are strained solely in compression.

The design shows longitudinal or strut-rods running from floor beam to floor beam parallel to the center lines of the trusses. These rods are designed to transmit the longitudinal component of the stress in the lateral rods from the free suspended floor beams to the next fixed floor beams, the fixed floor beams being those at the foot of the braces.

*The Cost.*—The advantages of the combination bridge over the Howe truss having been pointed out, the important element of cost remains to be considered. In order that the comparison be fair, the same factor of safety and quality of materials and workmanship must, of course, be assumed for both. Unfortunately, Howe truss bridges are so frequently built deficient in strength, and, at least as regards the iron, of most inferior material, that prevalent ideas as to their cost are usually below their actual cost when properly constructed. It may be claimed as an advantage in their favor that any good bridge carpenter can build them, provided he buys the rods, the castings and the timber; but this advantage has practically had the result that in very many cases the bridge carpenter is not told to build the bridge from detail plans furnished him, which is all he is competent to do, but he is intrusted with its construction without plans, and expected to proportion and design it himself. This becomes particularly hazardous when he acts in the capacity of contractor and the promptings of pecuniary gain are added to his ignorance. While wood possesses, among many defects, the estimable and redeeming quality of frequently giving warning of weakness if overstrained, by its outward appearance, it does not do this under all conditions, and in a Howe truss the iron rods are as essential to the safety of the structure as are any of the members of an iron bridge. It is therefore a very erroneous idea, though quite a popular one, that Howe truss bridges do not require that attention and regard for safety which iron bridges do.

The table on page 6 gives the quantities of materials in Howe truss and combination bridges and their cost without erection, based upon detail bills of material prepared for the different spans and the different

kinds of bridges considered. A few approximate prices are added for iron bridges with wooden stringers, in order that a comparison may be made with them also. The 75 feet and the 124 feet spans are proportioned for consolidation engine loads (engine and tender weighing 161,200 pounds over a wheel base of 45¼ feet). The 147 feet, 168 feet and 210 feet spans for a rolling load = 2500 pounds per foot of bridge; hence the first two spans should not be compared with the latter three. The span lengths and assumed loads were chosen so as to make some old estimates, prepared for a different purpose, which I had on hand, available, and thereby reduce the labor connected with the preparation of the table. It was, of course, of importance only, for the purpose in view, that the same spans be calculated on the same basis. The lumber is assumed to be long-leaf yellow pine, except the cross-ties, which are estimated of oak. The prices are those ruling several months ago; for iron they are Pittsburgh prices, with 20 cents per 100 pounds added to cover transportation charges, and for yellow pine they are those of the Alabama Lumber Association, with $12 per 1000 feet added on the same account. The location of the bridges corresponding to these freight rates may be assumed in the neighborhood of Louisville or St. Louis. The oak is estimated to cost $18 per 1000 feet on the ground. Pittsburgh prices for the cast iron in the Howe truss bridges were assumed at 2.8 cents per pound, and for the cast iron in the combination bridges at 3.3 cents per pound, and the average prices for the wrought iron in the 168-feet spans were as follows: 5.26 cents per pound for Howe truss with wooden clamps; 5.65 cents per pound for Howe truss with iron clamps; 5.69 cents per pound for combination bridge with wooden floor beams and wooden compression braces; 5.65 cents per pound for combination bridge with iron floor beams and iron second compression brace. The yellow pine averages $31.50 per 1000 feet for the last named combination bridge, and $35 for the Howe truss, delivered.

As Howe truss bridges are now seldom built with wooden clamps for splices in the bottom chord, iron clamps making a much better connection, it would be proper to compare the cost of the combination bridges only with the cost of the Howe truss bridges built with iron clamps; but I have thought best to include also the Howe truss with wooden clamps in the comparison, in order to show that even this the cheapest form of wooden bridge compares unfavorably with the combination bridge in point of economy. A further assumption in favor of the Howe truss bridge is made in that the keys are estimated of wood for it and of iron for the combination bridge. The combination bridges with iron floor beams have been estimated of the same panel length as the combination bridges with wooden floor beams, in order to avoid the necessity of making new calculations and estimates entire for the bridges on this plan. The panel lengths should have been increased, and the cost of the combination bridge with iron floor beams would then have appeared lower than it does. Making allowance for this, the table shows: 1. That the cheapest form of combination bridge (with wooden floor beams and wooden compression braces) is cheaper than the cheapest form of Howe truss bridge (with wooden clamps). 2. That the combination bridge with wooden floor beams and intermediate braces of iron is still cheaper than the same form of Howe truss, or at least as cheap; and 3. That the best form of combination bridge (with iron floor beams and iron intermediate braces) is as cheap as the best form of Howe truss bridge (with iron clamps). These results are very surprising at first glance, but a study of the table and the following considerations will afford necessary explanation.

In the combination bridge the panel length may be as long as the wooden stringers or wooden floor beams will permit. A convenient length for the former, and one which will not require the sticks to be over 16 inches deep, is 15 feet. In the Howe truss bridge the bottom chords have the double duty to perform of carrying local loads to the panel points—the wooden floor beams being laid directly upon the chords—and of acting as truss members. To the direct tensile strains are added, therefore, cross or bending strains, and it is generally necessary to reduce the panel length to about 10 feet in order to keep within practicable limits in the sizes of the timber. It has already been shown that there is much waste of timber in the bottom chords, owing to the difficulties in the way of splicing the timber, the sticks joined having to be neglected in calculating the effective chord section. To this item of extra cost is now to be added the extra material required in the web by the use of short panels, on account of the greater number of braces, of rods and of castings. The table shows that there are two to three times as much timber required in the Howe truss as in the combination bridge, and owing to the lengths and the large sizes necessary for the bottom chords, the timber is more expensive per 1000 feet. The joint boxes in the top chords of the combination bridge occur only every 30 feet, and very little cast iron is necessary in the bottom chords. As a result, we find the cast iron required for the Howe truss bridge 50 to 100 per cent. in excess of that necessary for the combination bridge. The wrought iron being used to great advantage in the combination Warren bridge, the increase in this item is comparatively small. The bottom chord bars are 30 feet long, and there is therefore little loss through frequency of joints, and the web members act at a favorable angle. In consequence, the wrought iron in the cheaper form of bridge with floor beams and compression braces of wood is at most only 60 per cent. greater than in the Howe truss. The table of cost does not include erection. If this item had been considered, the showing would have been still more favorable to the combination bridge, the latter requiring less and simpler framing. But it was my purpose less to show how much cheaper combination bridges are than Howe truss bridges than to establish that they compare so favorably in first cost with the latter that, in consideration of their many superior merits, there can be no question as to which preference should be given. Attention has been called to the advantages of iron floor beams over wooden ones. The table shows the increase of cost to average about $4 per lineal foot, and I cannot conceive of any conditions which would not justify this additional expenditure, and also the extra cost of making the intermediate web braces of iron, leaving only the end braces and top chords of wood.

COMPARATIVE STATEMENT FOR HOWE TRUSS AND COMBINATION THROUGH BRIDGES,
*Showing the Materials Required, and the Cost, Exclusive of Erection.*

| Length of Span. | | Howe Truss Bridge. | | Warren Combination Bridge. | | |
|---|---|---|---|---|---|---|
| | | | | Floor beams of Wood. | | Iron floor beams. All braces except end braces of iron. |
| | | With woo len clamps and wooden keys. | With iron clamps and wooden keys. | All compression braces of wood. | All braces except end brace of iron. | |
| 75 ft. Heavy rolling load. | Panel length, feet | 10.7 | 10.7 | 12.5 | 12.5 | 12.5 |
| | Depth, feet | 23.0 | 23.0 | 22.0 | 22.0 | 22.0 |
| | Wrought iron, pounds | 10,050 | 10,780 | 14,160 | 14,160 | 22,600 |
| | Cast iron, pounds | 6,680 | 7,970 | 6,190 | 6 190 | 4,810 |
| | Yellow pine, feet | 25,680 | 25,680 | 11,250 | 11,250 | 8,680 |
| | White oak, feet | 3,180 | 2,900 | 4,550 | 4,550 | 4,550 |
| | Cost per foot of bridge | $21.00 | $22.30 | $19.40 | $19 40 | $24.25 |
| 124 ft. Heavy rolling load. | Panel length, feet | 10.3 | 10.3 | 15.5 | 15.5 | 15.5 |
| | Depth c. to c. chords, ft. | 23.5 | 23.5 | 24.0 | 24.0 | 24.0 |
| | Wrought iron, pounds | 23,870 | 26,550 | 29,830 | 36,850 | 48,700 |
| | Cast iron, pounds | 16,61c | 20,760 | 10,000 | 9,500 | 7,570 |
| | Yellow pine, feet | 48,270 | 48,270 | 21,300 | 20,430 | 16,830 |
| | White oak, feet | 5,670 | 4,870 | 8,720 | 8,720 | 8,720 |
| | Cost per foot of bridge | $28.20 | $31.00 | $24.30 | $27.10 | $30.60 |
| 147 ft. Light rolling load. | Panel length, feet | 10.5 | 10.5 | 14.7 | 14.7 | 14.7 |
| | Depth c. to c. chords, ft. | 23.5 | 23.5 | 25.0 | 25.0 | 25.0 |
| | Wrought iron, pounds | 29,250 | 33,170 | 40,320 | 47,740 | 62,940 |
| | Cast iron, pounds | 19,430 | 24,510 | 13,000 | 12,120 | 9,640 |
| | Yellow pine, feet | 59,740 | 59,740 | 25,940 | 23,430 | 18,810 |
| | White oak, feet | 6,800 | 5,750 | 8,840 | 8,840 | 8,840 |
| | Cost per foot of bridge | $29.20 | $32 45 | $25.55 | $27.90 | $32.20 |
| 168 ft. Light rolling load. | Panel length, feet | 10.5 | 10 5 | 14.0 | 14.0 | 14.0 |
| | Depth c. to c. chords, ft. | 23.5 | 23.5 | 26.0 | 26.0 | 26.0 |
| | Wrought iron, pounds | 38,750 | 43,730 | 61,950 | 71,650 | 90,240 |
| | Cast iron, pounds | 25,820 | 31,760 | 15,680 | 14,820 | 11,790 |
| | Yellow pine, feet | 74,790 | 74,790 | 32,020 | 29,320 | 23,670 |
| | White oak, feet | 7,870 | 6,640 | 9,980 | 9,980 | 9,980 |
| | Cost per foot of bridge | $33.60 | $37.15 | $32.00 | $34.90 | $39.35 |
| 210 ft. Light rolling load. | Panel length, feet | 10.0 | 10.0 | 15.0 | 15 0 | 15.0 |
| | Depth c. to c. chords, ft. | 28.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| | Wrought iron, pounds | 76,520 | 83,600 | 95,840 | 105,740 | 127,740 |
| | Cast iron, pounds | 47,100 | 55,250 | 23,510 | 22,220 | 18,640 |
| | Yellow pine, feet | 120,690 | 120,690 | 51,810 | 48,770 | 42,090 |
| | White oak, feet | 10,960 | 9,200 | 14,090 | 14,090 | 14,090 |
| | Cost per foot of bridge | $47.70 | $57.45 | $40.05 | $42.25 | $46.10 |

The cost of a 147-foot span in iron with wooden stringers, on the above scale of prices, is $47 50 per foot approximately, and of a 168-foot span, $52.60 per foot approximately.

## A Costly Cellar.

The cellar now being excavated under the apartment houses at Fifty-eighth and Fifty-ninth streets and Seventh avenue, New York, has been blasted out of solid rock that, before the work was commenced, in some places towered as much as 25 feet above the surface, so that in part of it excavation to a vertical depth of 36 feet was necessary. The grade of the cross streets is such that in the length of the building, 425 feet, there is a rise of 14 feet in Fifty-ninth strect and 19 feet in Fifty-eighth street. Consequently the level of the parlor floor, which is 7 feet above grade at Seventh avenue, will be 21 feet above grade at the eastern extremity of the building, and in the four houses toward the end will be the second story. The houses are spoken of as separate, and they practically are so, but in appearance they will all form one structure, arched colonades connecting and binding them together. The cellar starts 4 feet below the grade at the eastern end, and is 18 feet below grade at the western—that is, for a space 405 x 200 feet. Around this is a vault under the sidewalk, 15 feet wide, at a uniform depth of 16 feet below grade, to afford perfect drainage, as well as to give space for boilers and coal storage. The central tunnel, entered from the eastern end, will have a depth of 12 feet in the clear below the courtyard, and its floor at the entrance will be only 6 feet below the grade of the cross streets at that point. By this tunnel access will be given to the servants' and freight elevators. Messrs. Hubert & Pirrson, the architects, estimate approximately the total amount of rock removed at 45,123 cubic yards, which at $2.50 per cubic yard, the ordinary price for such excavation, would bring up to $112,800 the cost of merely digging this big hole. The foundation walls required to support the 10-story construction to be reared upon them, the cementing, &c., will increase the expense of this cellar by about $320,000, so that the total cost up to the top of the cellar wall will be not less than $430,000. The buildings, when finished, will have cost not less than $400,000 each.

## Specifications for the Finish and Appointments of a Bathroom.

We are indebted to Mr. Harry M. Wright for the following specification, with illustrations, of the trim and appointments of the model bathroom, which we think will be found of interest to many of our readers:

### Specifications

*For the finish of a bathroom for Mr. Thomas Brown, New York, according to drawings made by H. M. Wright.*

GENERAL DESCRIPTION.

The bathroom to be finished will be 11 feet 3 inches long by 5 feet 9 inches wide by 8 feet high. To be built in two compartments, viz.: A lavatory 3 feet by 5 feet 9 inches, and a bathroom 7 feet 9 inches by 5 feet 9 inches, divided by a 6-inch partition, with a 2 foot 6 inch doorway in the center, furnished with brackets, rod and rings for a curtain. The whole interior to be finished in ash, oiled and varnished.

WOODWORK.

The walls to be stripped with 2 x ¾ inch w. p. stripping, set 16 inches center to center.

The hardwood to be of best ash, well seasoned, free from cracks, loose knots or other defects. An architrave 4 x 1¼ inches, per detail, will run around windows, doors, and where shown on ¼ scale sketch.

The boarding in panels, dado and ceiling to be of 3 x ¾ inch ash, tongued and grooved and beaded on one side, the joints to fit close and to be secret-nailed.

The dado to be 3 feet 10 inches high, with 8-inch molded base. The boarding to be put on diagonally.

The ceiling will be paneled, as shown, with 4 x ¾ inch ribs and 3 x ¾ inch boarding, tongued and grooved and beaded, laid on diagonally, fitting close and snug. All boards must be cut in lengths to fit; no splicing will be allowed.

WINDOWS.

Window-sash in bathroom to be of 1¾ ash made for four 12 x 24 inch lights, to have a ¾-inch stop-bead of the same inside, to fit close to prevent leakage. Sash in lavatory will be of the same finish, made for two 18 x 24 lights. A paneled door 2 inches thick, 6 feet 8 inches high, of well-seasoned ash, according to design given, to be furnished where shown; to have a bronze knob and escutcheon, and mortise lock.

Bathroom windows to have bronze fasteners of approved pattern. Two polished brass brackets for 1½-inch rod will be hung over door between bath and lavatory.

GAS FITTING.

Gas pipe ½-inch diameter, with necessary T and L joints, will be laid under flooring and connect with burners where indicated, and with nearest house main.

Two polished brass single-light brackets with globes to be furnished, one for each room.

PLUMBING.

Lavatory to have a water-closet, as per plate No. 163 (Climax), Mott's catalogue, 1879, with 3-inch iron vent carried to roof, and cast-iron drain. Wash-stand to have 14-inch bowl and Tennessee marble slab, with 5-inch back and sides, molded edges, put up securely with plaster of Paris and screws. To have ¾-inch hot and cold water supply, with Doherty's patent self-stopping cocks, plug and chain complete; waste and overflow to be of 1½-inch bore.

BATH TUB.

A 5-foot tub on wooden frame, lined with 16-ounce tinned copper, with ¾-inch hot and cold water supply, 1½-inch waste and overflow, nickel-plated cocks, plug and chain, will be furnished.

PAINTING AND GLAZING.

All hardwood to have one coat of best pure linseed oil and two coats of best piano varnish. Window in bathroom to have four lights 12 x 24 inches, ground glass. Six beveled-edge mirrors will be furnished, one over tub 20 x 52 inches, one in upper panel of door 22 x 32 inches, and each side of doorway in both rooms 14 x 52 inches.

In order that no damage will be done to the finish, the contractor will see that all plumbing and gas-fitting arrangements are completed and in working order before the hardwood is put on. The whole to be handed over to the owner in a first-class condition.

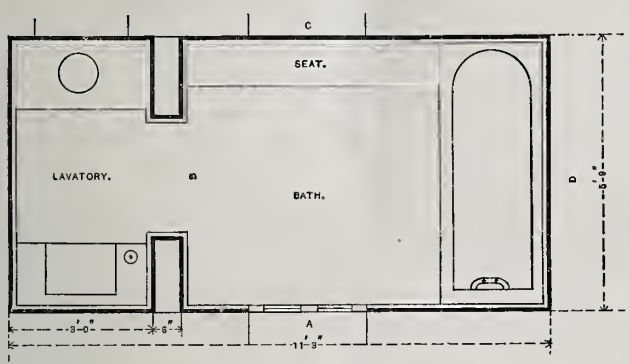



*Fig. 1.—Plan.*

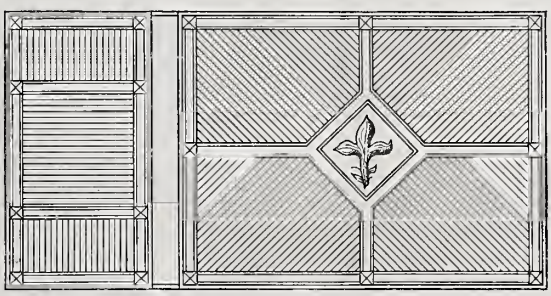


*Fig. 2.—Ceiling.*

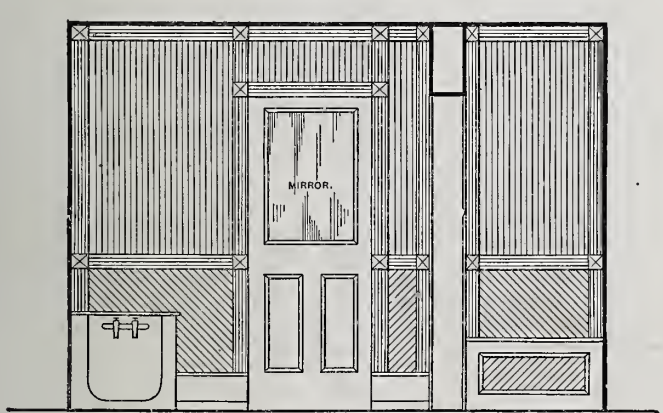



*Fig. 3.—Side A.*

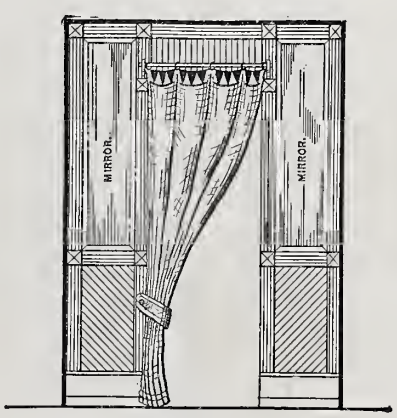



*Fig. 4.—Side B.*

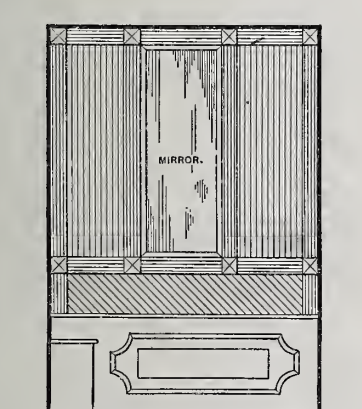



*Fig. 5.—Side D.*

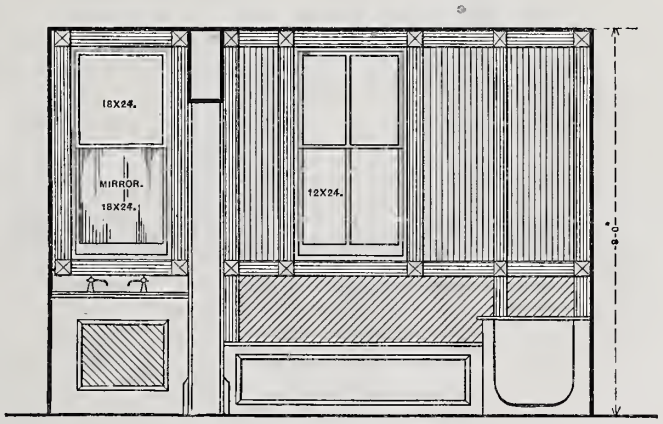



*Fig. 6.—Side C.*

FINISH AND APPOINTMENTS OF A BATH ROOM.

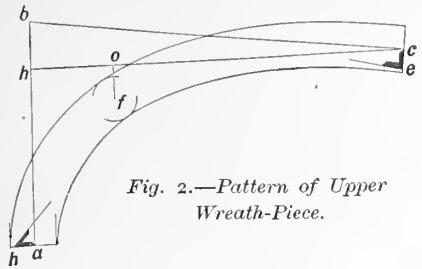



*Fig. 2.—Pattern of Upper Wreath-Piece.*

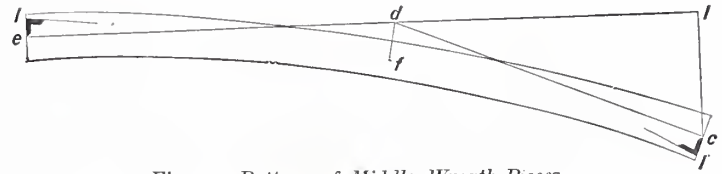



*Fig. 3.—Pattern of Middle Wreath-Pieces.*

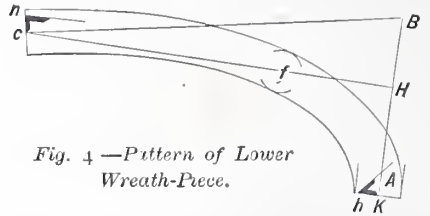



*Fig. 4.—Pattern of Lower Wreath-Piece.*

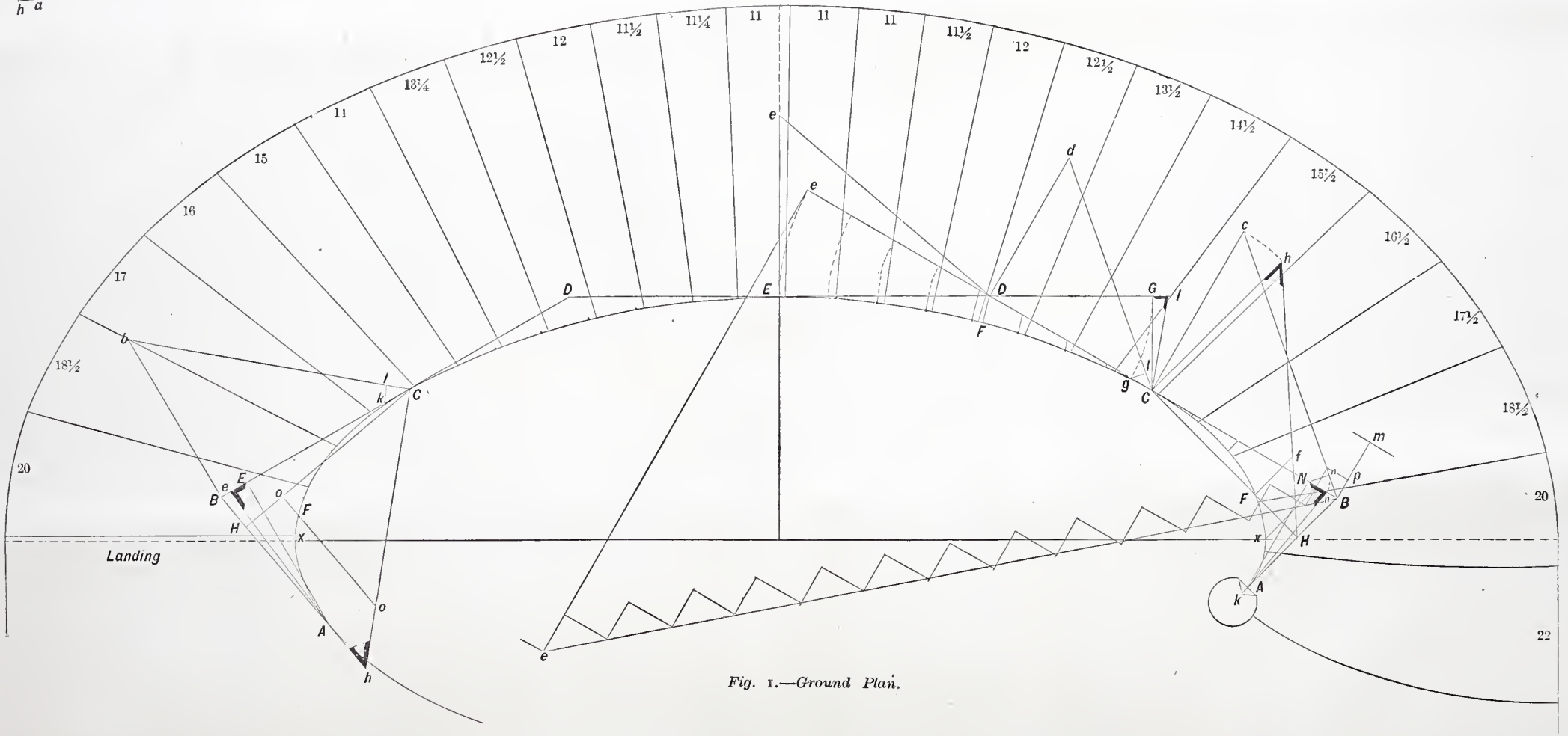



*Fig. 1.—Ground Plan.*

## PRACTICAL STAIRBUILDING.—PLAN FOR AN ELLIPTIC STAIRS.

## Practical Stairbuilding.—XXIV.

PLAN FOR AN ELLIPTIC STAIRS.

In the illustrations herewith Fig. 1 shows a plan for an elliptic stairs. The outside line represents the face of the wall string. The inside line is the center of the rail. The form of the landing is supposed to be a continuation of the ellipse. At the bottom of the stairs, the curve line from *x* to A is not a continuation of the ellipse, but is drawn with a shorter curve to give a better appearance to the turnout. From A to K is a straight line.

To draw this plan: First, draw the semi-ellipse representing the face of the wall string, making it to suit the place where the stairs are to go.* Then draw the inside line for the center of the rail. Draw these lines very carefully, so as to pursue a uniform width on the stairs. Place *x* and *x*, the short baluster of the second step, and the first baluster on the landing, both at the major axis line of the ellipse, as shown in the plate. Draw the landing riser parallel with the major axis. From *x* to *x* space off the short balusters only, according to the number of steps required. From *x* at the bottom draw the curve line *x* A to suit the eye, making the distauce *x* A a little less than the width of an ordinary tread at the front stringer. Draw the line K A B tangent to the curve at the point A. Through A draw a short line at right angles with K B, representing the width of the rail where it joins the cap. Place the center of the newel on a line with B K, and, with a radius equal to the width of the rail, draw the circumference line of the cap, meeting the ends of the short line which represent the edges of the rail. Take the distance from the center of the cap to K equal to half the radius of the cap, and from K draw the miter lines. Draw the curve line of the first riser to suit the eye. Mark all the risers at the front string; making, however, the distance from *x* to the second riser line a little more than the others. The width of the steps at the wall string should be graded somewhat as shown by the figures on this plan, so as to produce a gradual and easy curve on the top edge of the stringer. Draw the riser lines after the manner shown in the plate, gradually curving those toward the bottom of the stairs.

To draw the rail plan: Locate the point C about as shown in the plan, Fig. 1, making the distance from K to C short enough, so that the wreath-piece which stands over it can be got out of the plank in one piece. Through C draw the line *e* D C B tangent to the ellipse at the point C, and meeting the tangent A B at B. Draw the line D E D tangent to the ellipse at the point E. Above E take the distance E C equal to E C, and through C draw the tangent D C B. Make C B equal to C B at the foot of the stairs, and from B draw the line B A tangent to the curve at A. At the bottom of the stairs transfer the short balusters from the curve A C to the tangent line B C by lines drawn parallel with A B. Bisect the angle at D by the line D F. Transfer the short balusters from the curve line C E to the taugents C D and D E by lines drawn parallel with F D. With D as a center, transfer the points on the line D E to the line D *e* by the dotted arc lines. Consider B C D *e* as a base line, from which to draw an elevation plan of the short balusters, as far up as E. Draw the perpendicular *e e*.† Beginning at the lower end, first draw B *m* equal to one rise and a half; *m* is the floor line; *p* is the top of the first tread. Now, draw the whole elevation plan over the short balusters, as they are marked on the line B *e*. From *e* at the top, draw the pitch line *e* B. Now, according to the pitch of the line B *e*, draw the triangle B *c* C, showing the elevation of the tangent B *c* over B C. Draw C H at right angles with A B. Draw C *h* at right angles with H C. Make C *h* equal to C *c*, and draw the bevel line *h* H. From A draw A N at right angles with B C. From N draw N *n* at right angles with B *c*. Draw the arc *n n*. Draw the bevel line *n* A. From F draw the perpendicular F *f*.

*The best thing to draw a large ellipse with is a strong tape-line, with steel wire woven in the warp.

†This elevation plan is drawn bottom-up, to save space.

To draw the rail pattern for this lower wreath-piece: At the right hand of the ground plan, Fig. 1, make the line K A H B, Fig. 4, equal to the ground tangent line K A H B, Fig. 1. At right angles with K B draw H *c* equal to the bevel line H *h*. Draw *c* B. Take H *f* equal to H *f*. At A make the rail pattern about one-fourth wider thau the rail, and at *f* and *c* about one-sixth wider than the rail, and, as shown in the plate, draw the inside and outside lines of the pattern; *h* is the plumb bevel at K; *n* is the plumb bevel at *c*. This turnout piece has an opposite twist at each end.

To draw the pattern for the wreath-piece, which stands over C E, Fig. 1: Draw the triangle C *d* D, drawing the hypothenuse C *d* on the same pitch as the general elevation line B *e*. Ou the line D E erect the triangle D *e* E, drawing the hypothenuse D *e* on the same pitch as the elevation at B *e*. From C draw C G at right angles with D *l*. Make D *g* equal to D G, and from *g* draw *g l* at right angles with C *d*. Make G *l* equal to *g l*, and draw the bevel line *l* C.

To draw the face pattern: At the center of the ground plan, Fig. 1, draw the line *e d l*, Fig. 3, equal to the rake line *e* D, and *d l*. At right angles with *e l* draw *l c* equal to the bevel line *l* C. Draw *c d*. Bisect the angle at *d* by the line *d f*. Make the distance *d f* equal to D F. At *c* and *c* make the pattern wide enough for the twist, and at *f* only a little wider than the rail. Draw the curve lines in the usual way; *l* is the plumb bevel for both ends of the piece. The next piece of rail, from E to C, the same as this, only inverted.

To draw the pattern for the upper wreath-piece, Fig. 2, which passes from C around to A, where it joins the level rail on the landing: With the same pitch as before, draw the triangle C *b* B, showing the elevation of the tangent C *b* over C B. From A, draw A E at right angles with C B. Take C *k* equal to E B, and draw *k l* at right angles with C *b*. Take E *e* equal to *k l* and draw the bevel line *e* A. Draw C H at right angles with A B. Produce B A to *h*, making H *h* equal to B *b*. Draw the bevel line *h* C. At about the middle of the curve line C A, draw the line O F *o* parallel with H *h*.

To draw the face pattern: In Fig. 2, draw *a h b* equal to A H B, Fig. 1. At right angles with *a b*, draw *h c* equal to the bevel line *h* C. Draw *c b*. Take *h o* equal to *h* o, and from *o*, at right angles with *c h*, draw *o f* equal to O F. At *c* and *f* make the pattern about one-sixth wider than the rail, and at *a* about one-fourth wider than the rail. Draw the inside and outside curve lines in the usual way; *h* is the plumb bevel for the joint at *a*; *e* is the plumb bevel for the joint at *c*. This wreath-piece has an opposite twist at each end. This flight of stairs may be timbered very much in the same way as the half-circle stairs shown at Fig. 3, vol. iii, page 11.

## Plate Glass.

Glass is one of the most ancient of the manufactures, the discovery of the process being ascribed to the Phœnicians. Undoubtedly cast glass first found a practical use, blown, or the ordinary window-glass of today, being an after consideration and production. Probably tinted cast glass was first produced, and after that, in order, white or colorless cast, white blown or crown, polished plate, and, lastly, the blown cylinder or sheet glass in present use.

In a general way, the manufacture may be explained by saying that all glass is made from a mixture of sand and soda melted together in large clay crucibles or pots; by preference, a number of other substances—arsenic, manganese, &c.—are added, to produce brilliancy of surface, transparency or freedom from stain, according to the ideas and desires of the different manufacturers. Sand, however, is the base, and the purer the sand the greater the opportuuity for the production of a perfect article.

Plate glass may ordinarily be divided into three classes: Rough (cast), polished (cast) and crystal, each having its special uses and characteristics. In order of manufacture rough comes first, and derives its name from the appearance it bears of being hammered, whence in some quarters it is called "rough hammered glass." In its manufacture, when the mixture of sand and alkali is melted, the contents of the pot are poured on a large iron table, the "molten metal," as the glass is then called, being followed by a copper or iron roller, which spreads the metal over the table and produces an even thickness, which thickness is established by bars of iron of the desired thickness placed on the table at each side; immediately as the metal has passed from the molten to the rigid state, the "plate," for it has assumed this name, is transferred to the floor of a heated annealing oven, there to cool gradually. This is a matter of necessity; otherwise the result would be a mass of fragments, consequent upon the rapid cooling.

This part of the process is most important, and too much care cannot be exercised, nor can the workman have too much experience, for at the point of change from molten to rigid state is decided whether the glass shall be hard and brittle, or, as is termed in the trade, "soft"—a very important factor, as those who use it know full well. This, then, is the rough glass of commerce. It ranges in thickness from ⅛ to 1½ and 2 inches. Ribbed glass is practically the same as rough, the difference appearing in the ribs or fluting on one side. This is caused by similar ribs being cut in the iron table on which the metal is poured.

Where polished plate is required, extreme care is taken that the mixture is thoroughly melted, to preclude as far as possible the appearance of air bubbles in the glass, and the first result is rough glass; two plates are then taken, one placed on the other, with sand and water between; the constant moving of the upper, by machinery, with the application of fresh supplies of sand and water, grinds away the two plates until every vestige of the original surface is lost; then by application of sand and emery, constantly increasing in degress of fineness, a delicate, satiny surface is obtained; this operation is performed on both sides, and then, by a protracted system of rubbing on every particle of surface with a putty of oxide of tin or rouge on felt rubbers, the glass loses its semi-opaque appearance, and shines out, the polished plate of commerce. An item of some interest may be stated here. It is our impression that the machines employed in polishing glass, and now used in Europe and America, were invented in Newark, N. J., the inventor, a man now 80 years old, unfortunately reaping no benefit therefrom, even in the credit of his invention. If, as is frequently the case while grinding, air bubbles of a size sufficient to condemn are in the plate, and can be removed by grinding away the whole surface of the plate without making the glass too thin, this is done, that a more perfect piece of glass may be the result; and the fact that the larger the plate the greater the liability to this particular defect, and the consequent difficulty in producing large sizes free from blemish, causes a rapid increase in the relative cost per square foot as the size increases.

Rough plate is manufactured in England, Scotland, France, Belgium, Austria and Germany, and in Massachusetts, Pennsylvania, Indiana and Missouri in this country. The American production being to all intents and purposes equal to the foreign, it has practically supplanted the imported article. Polished plate occupies a different position. This is generally known under three names—French, English and American. The principal part of the so-called French production comes from the Province of Alsace, now under German rule. Demands are constantly made by owners, architects or builders for a certain manufacture of glass, without a proper appreciation of the merits of the different kinds, and although a full explanation would involve not only an extended description—and, for that matter, analysis—of all the varied points of the different manufactures, but after that a thorough study of each product, which means a life's study, some hints appear to be in order. French has the purest—and if it may so be called, the most colorless—quality, and, in consequence, is best adapted to use in mirrors, largely owing, too, to a superior quality of polish maintained; but when exposed to the sun's rays, this glass almost invariably changes from its colorless

state to a marked yellowish tinge, a certain and palpable defect not so common either in English or American. French being "soft" is more easily scratched than that of the other countries, notably the English. On the other hand, English glass has in its original state a marked greenish-blue tinge which an expert readily detects, and which shows to a certain, though limited, extent in mirrors, but, whether owing to this color or not, it is in some manner protected largely from sufferi: g the change brought about by direct sunlight; it maintains its color when exposed to the sun, and this, with the hardness of its surface, which protects it in a measure from damage by scratching, gives it its value for use in store fronts and for general building purposes.

The manufacture of American plate is, as an industry, yet in its infancy, though to look at the few factories in the West one might be tempted to say it is an infant of large growth; still it is an infant. Some beautiful glass was produced at Lenox, Mass., 15 or more years since, as fine in polish and quality as any foreign product that ever crossed the sea; but in a commercial way that was but an experiment, and it was for later hands and larger capital to place the glass in the market. To-day these factories are selling their glass as fast as manufactured, and which, for all ordinary uses, is as good as any, both in color and quality, and can be just as favorably employed. In color it is slightly lighter than the English, with more of the blue tinge than the French, and it maintains its color admirably. It is not as free from the imperfections of air bubbles and threads as either the French or English, and has not as yet attained the fine degree of polish and surface seen in the foreign article. These imperfections are not marked, and generally are not appreciated by any but experts or those accustomed to looking for defects; they are probably consequent upon the haste—American enough—to place the production in the market, and, too, the demand made upon the factories for their glass. The requirements of the age will doubtless prove to the manufacturers that excellence is the only key that will unlock the door to permanent and remunerative trade, and when that excellence is attained and maintained there is no reason why American polished plate glass should not combine the merits of both French and English, and be superior to either for mirrors, durability of color and hardness of surface. To-day, however, the mirror displays its blemishes and points out its weaknesses.

Crystal plate, or German looking-glass plate, is a glass largely used in smaller mirrors, in house windows, in cars and coaches; it is much thinner than the plate glass of commerce, being usually from 1-16th to ⅛ inch in thickness, and is distinctive in manufacture. Originally, instead of being cast, it is sheet glass blown much thicker than ordinary window glass and of much finer quality, and then passing through the process of grinding and polishing, as in cast plate, it becomes a similar article in appearance and value. It is principally manufactured in Bavaria, although to a large extent in England. It is especially adapted to the manufacture of mirrors, the thinness and purity of the best grades tending to make the mirror almost colorless.

A suggestion as to the setting of plate glass may not be out of place here. If set in iron frames, a cushion of paper or some similar substance should always separate the edge or ends of the glass from the iron, the jarring of the frames, settling of the building or expansion and contraction of the frames rendering a fracture liable, and this gives additional force to the adage, "An ounce of prevention is worth a pound of cure."

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At Washington, Fayette County, Ohio, it is proposed to erect a courthouse, the estimated cost of which is $100,000.

*Novelties.—Fig. 1.—Decorative Brasswork.—Portfolio Rack of Burnished Brass Rods.*

## NOVELTIES.

### Decorative Brasswork.

No one can fail to be struck with the great amount of bras work used in decorating modern houses. We find it everywhere. Indeed, the frequency of its appearing almost recalls the days when hammered brass and *repoussé* were the glory of gold workers, who did not disdain to exercise their skill upon the baser alloyed material. There is a very close connection between bronzework and brasswork, but whereas the former, fashionable as it is, is mainly the work of foreign artisans, under the direction of French and Belgian principals, the latter is daily becoming more successful as an article of domestic manufacture. The reason of this is obvious; most of the ornamental brasswork upon stoves, fenders, chandeliers and articles of the same kind can be manufactured in great quantities, and after the models are once made the process becomes mechanical, whereas the perfection of bronzes lies in the artistic finish given to each individual piece. The skill necessary to the perfecting of original conceptions is still in its infancy here, while in many European countries it is an absolute inheritance, and the art of working in bronze and in brass is handed down from father to son, and in the same way the details of composition are often family secrets. It is very difficult to imagine where the use of brass in decoration will stop. It has so very much to recommend it that it is no wonder that it is becoming more and more popular, and that it is to be met with alike in the homes of the wealthy and the small apartments which are at the command of persons of very limited income. Now, more especially, brass is desirable, since it is possible to polish it without hand-burnishing. It has taken many experiments, many failures and much patience before it has been feasible to communicate a highly-polished surface to the material by the use of artificial means, but now that it has been accomplished, an immense impetus has been given to the trade in brass. It would be impossible to call to

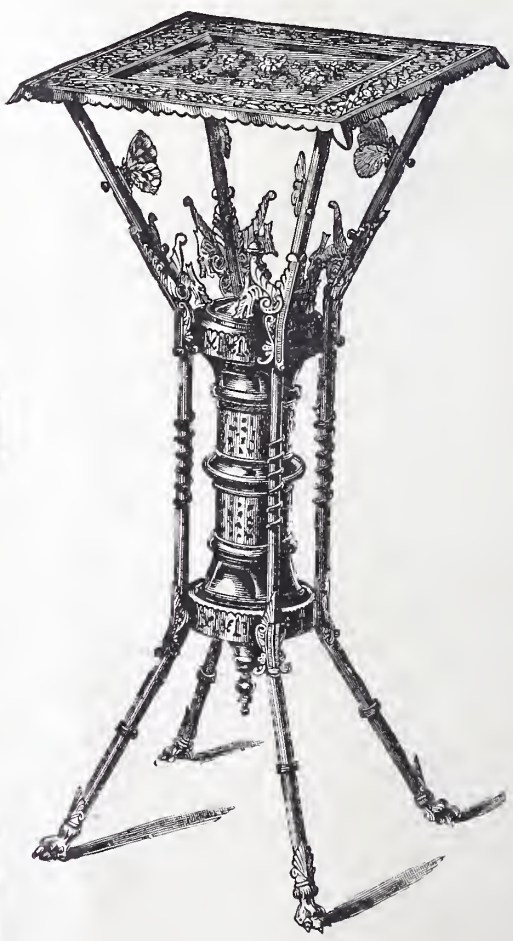
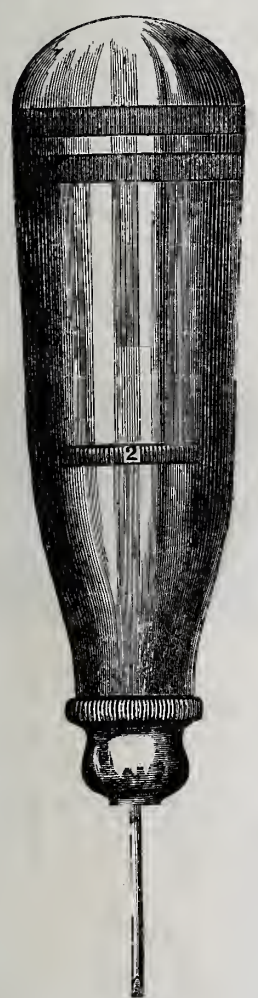


*Fig. 2.—Parlor Stand Executed in Ornamental Brass.*

mind even a quarter of the beautiful things now manufactured in this material, but a few of them are familiarly known to every one of us—as lamps, for example, the latest style of which is found in spiral columns of burnished brass, surmounted by a globe. Chandeliers in the center of the room are no longer fashionable in very luxurious dwellings, but until the electric light completely banishes gas from our midst they will be found in the majority of homes. The brass used in their construction differs from that employed for articles which need constant polishing, such as the facings of stoves, andirons, &c., in the fact that it is lacquered, or polished with a fine composition, which gives it additional luster, but would not stand any very frequent polishing. Occasionally the brasswork of chandeliers is relieved by the admixture of cut-glass drops or stars, and every possible combination of porcelain and brass ornamentation is found in gas fixtures and fittings. Frames of wrought iron or of ebonized or carved wood are fitted with the finest brass wire, which is almost as fine as spun silk, and which is often very beautifully decorated with a center of *repoussé* work. Embroidery is mounted in frames of hammered brass and beautiful effects are produced by its introduction in the fitting of colored glass for medallions, circlets, screens, and even mosaic window margins. Rods of polished brass are found upon the carved upper mantels of large houses; and in the midst of dark-wood fittings for bookcases, library shelves, and even stairways, brass, with its lightning gleam, is found. A novelty in door handles has been introduced in up-town houses in those made of wrought brass in the shape of shells, an idea which is certainly practical, and should prevent much splitting of gloves on the part of those to whom small sizes in kids is a matter of moment.



*Novelties.—Fig. 3.—Kidder's Patent Tool Holder.—Elevation.*

Until within the last few years, English manufacturers and French and Belgian artisans maintained their leading position in the making of ornamental brasswork. Lately, however, our American artisans have in this, as in so many other branches of industry, began to rival, and in some cases even to far outstrip, European workmen, both in design and workmanship of articles of this kind. The Ansonia Brass and Copper Company, of 15 to 21 Cliff street, in this city, especially deserve mention for the artistic designs and exquisite workmanship displayed in the manufactures of their lamp and fixture department.

We present to our readers in this issue, in Fig 2, an illustration of a parlor stand, the design and execution of which are both novel and exceedingly beautiful. Fig. 1 is a portfolio rack made altogether of burnished brass tubes of finest finish, and the illustration gives but an inadequate idea of its beauty and of how ornamental a piece of furniture it really makes.

### Kidder's Patent Tool Holder.

We present in the accompanying engravings a new tool-holder, manufactured by Mr. R. E. Kidder, of Worcester, Mass., and which will be found both useful and convenient for many purposes. As seen in Fig. 4, which represents a sectional view of the apparatus with one of the tools in position for use, the holder consists of an outer case or handle, within which the mechanism to be here described is contained. The latter consists of a reservoir which projects through the handle and is numbered to the size wanted. At the lower end of the apparatus is a nut, B, by means of which the tool, after being placed in its proper position, may be tightly clamped. Our readers will probably obtain the best idea of the apparatus by means of a few words giving directions for use. In order to prepare it for work the nut B is first removed so as to release the pins or clamps F F, which may be moved laterally by the action of the springs G G, as shown in Figs. 4 and 5. The small end of the apparatus is then held highest, and the reservoir D is turned by means of the milled head, which is shown in Fig. 3, and which is provided with six numbers corresponding with the six tools in the handle. The position of the appliance is then reversed, and one of the tools C C slides to the end of the tube E, and may then be firmly secured by screwing up the nut B, which forces the clamps F F together. The reservoir, it will be understood, consists of six separate and distinct chambers, and should never be turned when the tool is out, since the latter must return to the same number from which it came. The stop H, shown at the top of the apparatus, plays into the end of the reservoir D, and the action of a spring prevents it turning of its own accord.

The appliance is well suited for holding brad-awls, and its advantages, we think, will be readily appreciated. Among these we would mention that there is no necessity of taking the awl out of the handle to change it, as is generally the case with other appliances of this kind, and upon screwing up the nut B it is impossible to pull the awl out of its socket. The six awls can be changed in a very short time, and the arrangement moreover presents the additional advantage that they can never drop out and thus be lost. The handle A is made of malleable iron and steel, and is nickel-plated, and both workmanship and appearance will undoubtedly greatly contribute to a favorable reception of the appliance.

### Improved Automatic Knife Grinder.

The engraving (Fig. 6) which accompanies this article represents an improved automatic knife grinder, built by the Springfield Glue and Emery Wheel Co., of Springfield, Mass. It is well adapted for grinding all kinds of long knives, as used on planing machines, trimming presses, leather-splitting machines, tobacco machines, shears, &c. It is provided with an emery-wheel 26 by 1½ inches, which is mounted in a swing-frame, and can be readily adjusted so that it can be used advantageously even when almost worn out. As shown in our engraving, the apparatus is, moreover, furnished with cone pulleys, by means of which the speed may be increased or diminished as required, and cone pulleys on the feed-shaft regulate the carriage to any desired speed. By means of an automatic cross-feed, so arranged that it can be set to grind only the desired amount and then stop feeding, the time of an attendant may be saved, the latter being, as will be readily acknowledged, an important item. A dial, marked to degrees and placed at the end of the knife-bar, enables the operator to quickly

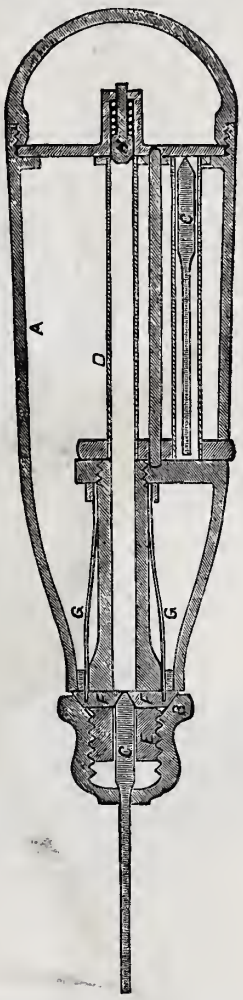
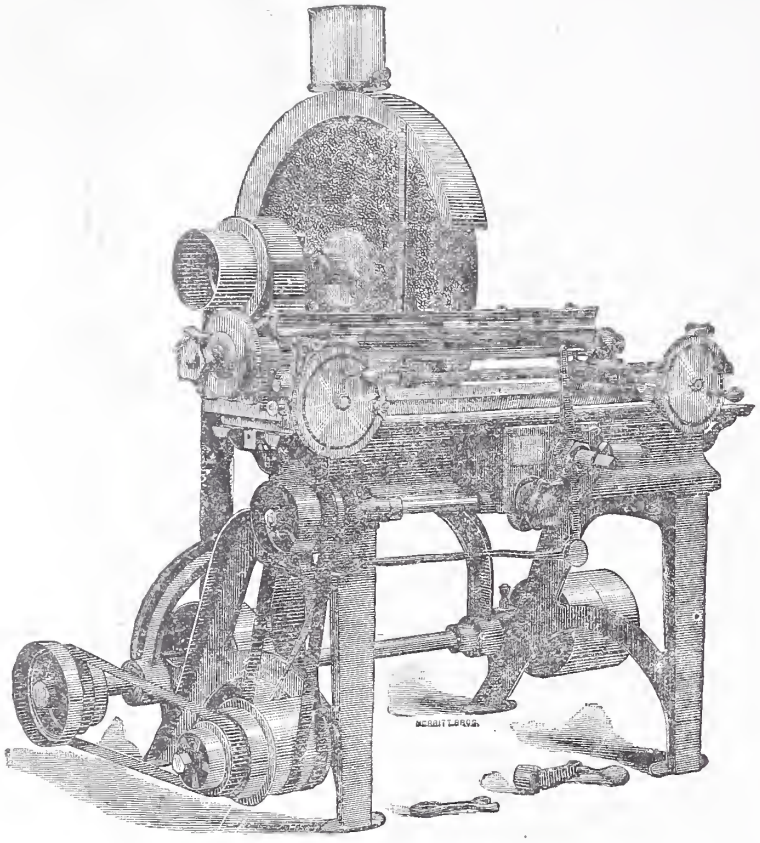



*Fig. 4.—Sectional View, Showing One of the Tools in Position for Use.*

set the bar and grind knives to the same degree or bevel as when previously ground. The knives can be set with their edges up or down, and may therefore be ground either to or from the edge, as may be desired. The emery-wheel, as shown, is inclosed in a metallic hood, having a reservoir on the top, from which a small quantity of water runs on the knife and prevents heating and drawing of the temper. Grinding with a dry wheel naturally causes heating, warping the knife to a greater or less extent. The hood, moreover, protects the wheel from dust, and the machine from loose emery, and a pan mounted on the carriage catches the surplus water. The motion of the carriage can be instantly stopped by dropping the worm

*Fig. 5.—Showing the Clamp Removed, so as to Let the Tool Drop Into Reservoir.*

operating it out of gear, and without slipping any belts or by the slow process of stopping the wheel. The latter should run at a speed of about 350 revolutions per minute. The working parts of the machine are well protected from the emery, and consequently require repairs less frequently than would ordinarily be the case. The whole machine is heavy, well proportioned and of good construction, and will, undoubtedly, not fail to respond to all reasonable demands which may be placed upon it. It is made of different sizes, grinding knives from 30 to 120 inches in length, and the price, of course, varies with the dimensions.



*Novelties.—Fig. 6.—Improved Automatic Knife Grinder.*

### Adjustable Window Screen.

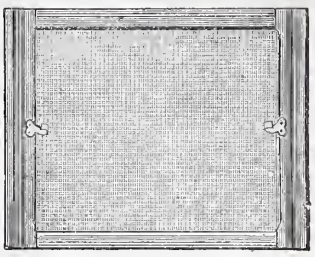
Edwin Louderback, of 413 and 415 South Fifth street, Philadelphia, is introducing a new adjustable window screen, which in Fig. 8 is shown closed and in Fig. 9 extended. The frames for these screens are so made as to permit an extension of 2½ inches on each side, or 5 inches in the total length of the screen, so as to fit the groove of any window to which the screen approximates in size. These screens may be made stationary by spreading them until the grooves in their ends cover the tongues of moldings fastened to the window frame, and securing them open in this position by means of a small screw through the frame of the screen. Screens of this kind have the great advantage for use by tenants of rented houses, and by persons occupying temporary apartments as boarders, that they can be changed from one window to another without any carpenter-work other than that of nailing on the tougued guides upon which they run up and down. The frames are of black walnut, and the wire cloth is well stretched and secured. They are made in sizes ranging from 22 inches in length closed, to 43 inches in length closed, and each size has 5 inches of extension, giving a total range of 22 to 48 inches. Different hights answer for any width.

### Automatic Bench Vise.

Fig. 7 represents Henson's patent self-adjusting vise, manufactured by Bartholomew & Henson, of Sidney, Ohio, and sold to the trade by L. Mendenhall, of northwest corner 4th and Race streets, Cincinnati, Ohio. This vise is attached to the bench by a swivel, as shown at A, allowing the vise to be adjusted to any angle by simply swinging the jaw B to the right or left. When not in use it can be swung around to the end of the bench, out of the way, as shown at C. The screw is supplied with a ratchet movement, D, so arranged that the jaw can be drawn out to the required distance, and then by one turn of the screw will firmly and with equal pressure grasp an object either straight or wedge-shaped. The jaw can also be used as a bench-stop.

### Improvement in Shutters.

The improvement in the shutters, shown in the illustrations, consists in forming a pocket back of the panel and hanging the lower section of the shutter with weights in the same manner that sash are hung, so that the shutter can be passed down back of the panel. This construction enables one to have the slats closed and the shutter raised sufficiently high to shield them from the rays of the sun, at the same time admitting sufficient light above. The upper folds of the shutter, being independent, can be left open or closed, as desired. This is made plain by our illustrations, Fig. 10 being a front view with the shutter partly down, and Fig. 11 a vertical section of the same. They are also used in connection with the rolling shutter, which is coiled up by a spring above the upper jamb of the window



*Adjustable Window Screen.—Fig. 8—The Screen Closed.*

frame. The manner of operating the slats by the use of a rod would be very objectionable in this case, as the rod would always be in the way. The manufacturer, therefore, has possessed himself of the arrangement known as the Hartford blind, for moving the slats, which is made clear by our illustrations. Fig. 12 is a cross-section through the stile of the shutter at the knob, A being the bead, B the style, C the slat and D the knob. The pinion, rack and metallic strip to which they are attached are shown let into the bead. Fig. 13 is a vertical section showing the rack, the pinion, the metallic strip to which they are attached, the knob and the end of the slats; *a* is the rack, B the metallic strip, C the knob and *d* the end of the slat. The pinion is made with a round hub having a square mortise, to which a square tenon on the slat is fitted. A metallic strip having holes the proper distance apart

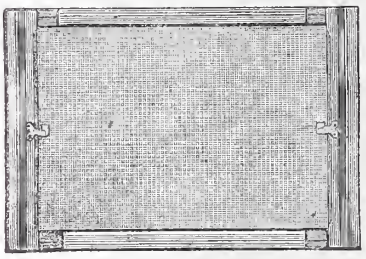


*Fig. 9.—The Screen Opened.*

for the slats receives the hub, and the pinions are operated by a rack at the back of the metallic strip. The pinions carrying the slats are rolled by means of the rack,

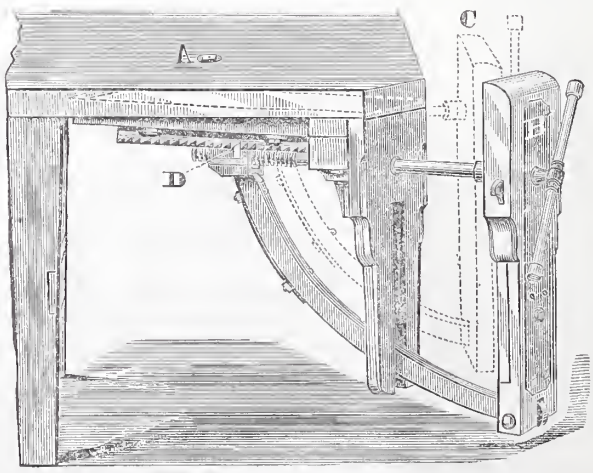


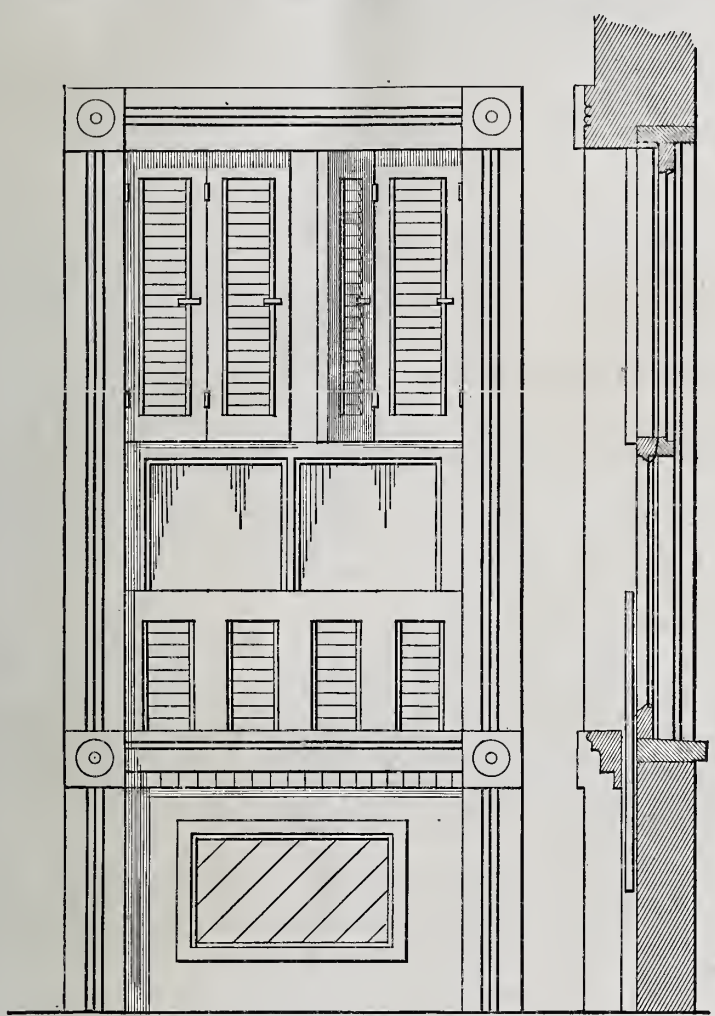

*Fig. 7.—Automatic Bench Vise.*

which is moved by the knob shown at C, Fig. 13. This manner of controlling slats is also well adapted to the ordinary style of shutters, as it does away with the unsightly rod, and the operation of the slats must necessarily be uniform. These shutters are put upon the market by James G. Wilson, whose office and factory is at 227–229 West

Twenty-second street, New York City. The shutters here described may be used in a great many instances in combination with the rolling shutter, the many uses of which, we presume, are familiar to most of our readers.

## Adhesive Power of Nails and Screws.

The extensive use to which nails and screws are put in construction lends considerable interest to any records of experience



*Novelties.—Figs.* 10 *and* 11.*—Improvement in Shutters.—Front and Cross Section, Showing Lower Portion of Shutter Partly Down Behind Panel.*

tending to discover their holding power. Haupt in his "Military Bridges" gives a table of the holding power of wrought-iron 10d. nails, 77 to the pound, and about 3 inches long. The nails were driven through a 1-inch board into a block and the board

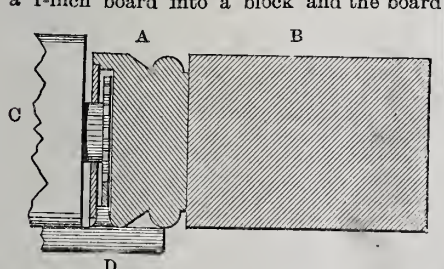



*Fig.* 12.*—Cross Section, Showing the Bead, Rack, Pinion, &c.*

was then dragged in a direction perpendicular to the length of the nails. Taking a pine plank nailed to a pine block with eight nails to the square foot, the average breaking weight per nail was found to be 380 pounds. Similar experiments with oak showed the breaking weight to be 415 pounds. With 12 nails to the foot square the holding power was 542½ pounds, and with six nails in pine 463½ pounds. The highest result obtained was for 12 nails to the square foot in pine, the breaking weight being, in this case, 612 pounds per nail. The average strength decreases with the increase of surface. Treadgold gives the force in pounds required to extract 3d. brads from dry Christiana deal at right angles to the grain of the wood as 58 pounds. The force required to draw a wrought-iron 6d. nail was 187 pounds, the length forced into the wood being 1 inch. The relative adhesion when driven transversely and longitudinally is, in deal, about 2 to 1. To extract a common 6d. nail from a depth of 1 inch in dry beech, across grain, required 167 pounds; in dry Christiana deal, across grain, 187 pounds, and with grain 87 pounds. In elm the force required was 327 pounds across grain, and 257 with grain. In oak the figure given was 507 pounds across grain. From further experiments it would appear that the holding power of spike-nails in fir is from 460 to 730 pounds per inch in length, while the adhesive power of screws 2 inches long, 0.22 inch in diameter at the exterior of the threads, 12 to the inch, driven into ½-inch board, was 790 pounds in hard wood and about one-half that amount in soft wood.

## Tin Plates.

There is a very active opposition among importers and consumers of tin plates to the recommendation of the Tariff Commission to increase the duty on tin plates from 1 1-10th cents to 2 2-10th cents per pound, which is by no means satisfied by the decision of the Ways and Means Committee to make it 2 cents. The following has been sent to us by the Philadelphia houses whose names are appended to it, with a request that we lay the subject before the building trade of the country, and ask their co-operation in an effort to defeat a wholly arbitrary and unnecessary inerease in the duty on an article of universal consumption not produced in this country:

PHILADELPHIA, December 14, 1882.

*Dear Sir:*—There is before Congress a project to increase the present duty on tin plates of 1 1-10th cents per pound to 2 2-10ths cents per pound, an advance of just 100 per cent. This enormous increase seems to have been gotten up in the interest of a few parties as against millions of consumers. Doubling the duty seems so absurd as hardly to be countenanced, but fearing the possibility of adverse legislation, we write to impress upon you the absolute necessity, if you are in favor of maintaining the present low value on tin plates, of writing at once to your Senators and Representatives in Congress, requesting them to vote against any advance in the present rate of duty. In a paper read before the Tariff Commission it was shown that the consumer was to-day paying just double the duty that was intended by the act of February 8th, 1875. The reduction of the duty to at least ¾ of a cent per pound was proposed as a compromise, as such a reduction would not conflict with any American industry. It was also shown how largely the consumption of tin plates has increased in this country, owing to a low range of values. Any advance in duty, besides making its cost so much dearer to you, would naturally check its consumption. We need not dwell further upon a subject which must commend itself to your prompt attention. We therefore hope that you will at once act upon our suggestion and endeavor to have the present duty reduced. The whole tenor of the report of the Tariff Commission is in favor of lower duties throughout. We therefore think tin plates should be reduced to ¾ of a cent per pound. It seems most unfair and

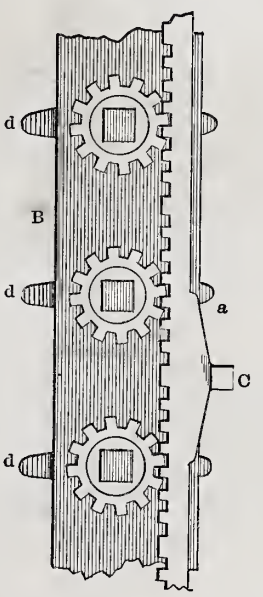



*Fig.* 13.*—Section Showing Rack, Pinions, Knob, &c.*

unjust to every consumer to single out this important branch of industry and revenue for an increased duty.

Very respectfully,
N. & G. TAYLOR CO.,
HALL & CARPENTER,
MERCHANT & CO.,
W. F. POTTS, SON & CO.,
GUMMEY, SPERING, INGRAM & CO.,
DILLON, FOLWELL & CO.

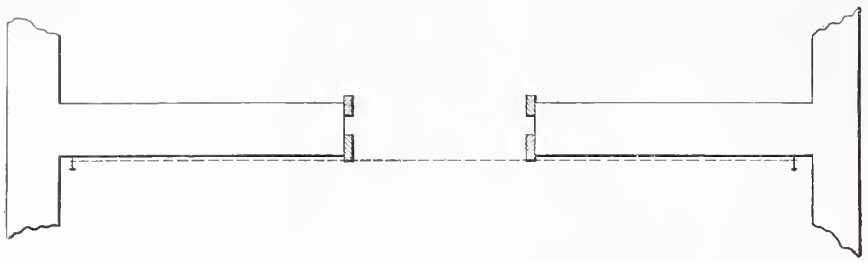
The very material increase in the cost of tin roofing and leader work which the proposed advance would entail is a serious matter to the building trades. It amounts to $1.10 per 100 pounds if the report of the Commission is adopted, and 90 cents per 100 pounds if the modification agreed to by the Ways and Means Committee is accepted by Congress.

The specific volume of the different constituents of green woods has been estimated to be as follows per 1000 parts: Hard green wood, fiber stuff, 441; water, 247; air, 312. Soft green wood, fiber stuff, 279; water, 317; air, 404. Evergreen wood, fiber stuff, 270; water, 335; air, 395. A certain amount of water—7 or 8 per cent. of all—is included with the fiber stuff, showing that about one-third only of the mass of the wood is solid stuff; the remainder is water or air space.

## CORRESPONDENCE.

### Putting Grounds on Brick or Stone Walls.

*From* S. W. H., *Russell, Kan.*—Inclosed find rough drafts showing my plan for putting up grounds for openings in brick or stone buildings. Stretch a line about 4 inches below the head of the openings across the room, as shown by dotted lines Fig. 1, at such a distance from the wall as is required for thickness of plastering; then make a plumb board the full length of the opening; next plumb down from the line to the floor, and make a mark on the floor at each jamb. For grounds use strips of boards full length



*Putting Grounds on Brick or Stone Walls.—Fig. 1.—Opening with Line Stretched.*

of opening, 2½ or 3 inches wide, with one edge straight. Then place one end of the piece at the line and nail it to the wooden-brick, and the bottom at the line previously made on the floor, and nail it also. Place the plumb board against the projecting edge so as to straighten it, and nail it fast to the wooden-brick. Then make a clamp similar to a siding hook, as shown in Fig. 2, the shoulders the required distance apart as you wish the door jambs to be in width. Then hold the same in position, as shown at A, Fig. 3, to form a gauge to nail the other

*Fig. 2.—The Clamp and Section of Grounds.*

piece of grounds by. When they are all completed they will be out of wind, and plumb. Where the opening is wide enough to receive the frame without removing the grounds I leave them; if not wide enough they can be taken off and used on other buildings; then when the frame is being set it only has to be plumbed sideways. The style generally used is to place them on the

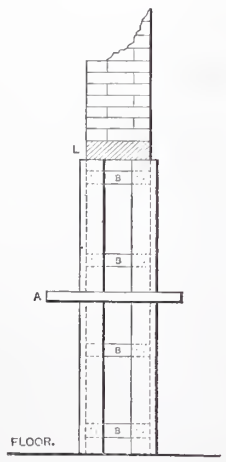



*Fig. 3.—The Clamp in Position.*

face of the wall, which I think is a very poor way, as they cannot be made so solid but what they will spring when the plastering is being done, and are liable to cup out and make the plastering thicker.

### Superintendence.

*From* F. H., *Millview, Fla.*—Some suggestions relating to the qualifications desirable in those having the superintendence of workmen have from time to time appeared in *Carpentry and Building*. All that has so far been said on this question is sensible. I do not, however, recollect any reference to a most annoying inconsistency of behavior common to many overseers of work that I beg leave to call attention to by way of an example. Suppose that two men, A and B respectively, have each had 20 years' experience at the carpenter's trade. The course of business makes it mutually convenient that A should employ B to work for him. A has never known much about B before engaging him, so of course he rates him way down in the scale. He assigns him a certain piece of work, such as he is accustomed to doing, and B sets about it in the way he believes from practice to be the best. At all events, custom has made that way the best for him. However, after some time has been spent upon the job A comes around and denounces B's method in the strongest terms, throwing out a broad hint to the effect that B has in all probability never worked up to that time under a competent superintendent. After cooling down a little, he good-naturedly condescends to explain to B a few rudimentary wrinkles, and concludes by admonishing him "never to do that way no more," forgetting that his method very possibly will be held up to ridicule by the next man for whom B works. This matter being disposed of by A in his own way, he assigns B another job, whereupon B, who desires to please, inquires what way he would like him to have him go about it. This question is a much sorer trial to A's temper than the first offense, and he informs him in not very complimentary terms that if he does not understand his business he had better say so and let a better man take his place. B is placed on the horns of a dilemma. He cannot please, however he may try. Being an honest man, there is no middle course open to him. He knows that truckling to every one's idea was not the way he learned what he knows. Respect for himself and for his calling breeds rebellion in his mind; consequently he does not get along very well with his employer.

A mechanic of any experience in carpentry cannot fail to know that often the same result may be accomplished by different methods of working. In fact, no two workmen will perform a given piece of work in precisely the same way. This may not be proven in all cases by a simple inspection of the work after it is finished, for two pieces will have a uniform appearance, however the result was reached. I contend that a workman cannot be expected to change his methods every time he changes his employer. If he is not allowed his own way of working, to a reasonable extent, experience is to him a dead letter, and he must renounce all ambition to perfect himself. I know that in this I raise the question, What, then, are overseers and foremen of work wanted for? I answer, to give men work to do, to see that they do work, and to see that the work is done up to the mark. I have no doubt that hundreds of the readers of the paper have seen such men as A, for the country is well supplied with them. It is no excuse for them that they are in the minority. Such minorities should not exist in a free country. A domineering manner, unlimited "cheek," and family or other connections often help men into a brief authority for which they are unfitted. Sometimes men of a superior knowledge and intelligence find themselves in a position requiring them to renounce their self-respect in pandering to the egotism of the foreman under whom they work. I recommend all employers of the A stripe for the future to hire none but unskilled laborers.

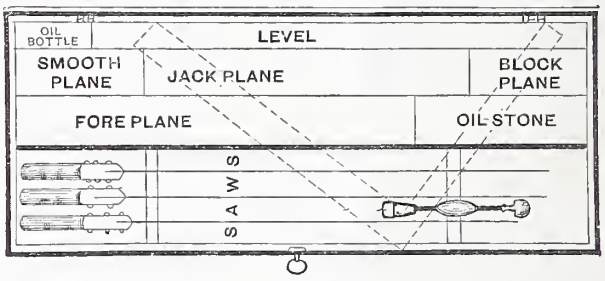
### Fire-Proofing a Shingle Roof.

*From* IGNORANCE, *New York.*—Can any of the readers of *Carpentry and Building* inform me with what kind of a solution I can wash the shingles on my roof so as to render them fire-proof?

*Answer.*—Probably the best material for the purpose is lime water. A strong solution of lye will impart the wood with power to resist fire, and this quality is also imparted by a solution of tungstate of soda. There are a good many brands of mineral paint for which fire-resisting qualities are claimed, and if our correspondent's house is in the country he might find that the effect of painting the roof with oxide of iron would be rather ornamental than otherwise.

### A Convenient Tool Chest.

*From* S. Y., *Clay City, Ill.*—I send a sketch of a portable tool-chest, and trust that it may prove of interest to some of the readers of *Carpentry and Building*. Its dimensions are 3 feet by 14 inches, by 8 inches inside measure. After the box was made, I divided it 2 inches from the top of the lid, and in these two spaces I put



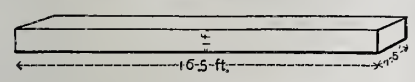

*Convenient Tool Chest.*

chisels, back-saw, auger-bits, try-square, &c. In the body I put partitions of ¼-inch stuff 2½ inches high, and far enough apart for the tools to fit in snugly. I also put in a small tray over the end occupied by the oil-stone and block-plane for small tools, &c. The steel square lies on as per dotted lines. If it has a 17 or 18 inch tongue, the box must be wider than 14 inches. I put hatchets, hammers and brace between the saws. The box complete weighs about 60 pounds, and can be carried on the shoulder or taken in a street car, as it occupies but little space. In moving and handling it can be rolled over and the tools will keep their place.

### Pitch of Rafters

*From* W. M., *Aurora Springs, Mo.*—S. O. E., of Evergreen, La., very sympathetically offered to help D. M. W. out of the difficulty in which he found himself in cutting rafters for a third-pitch roof, the width of the building being 18 feet. He very pomposly asks what is a third-pitch roof, but fails to answer his own question. He gives instead a diagram containing a mystical quarter circle, which is divided, and to which he applies his square with various results. If he had put in a few Latin words it would have been complete. In great

triumph he tells us that the exact length of the rafter for an 18-foot building is 10 feet 5 inches. What a triumph! I will not bother the Editor, however, with criticisms, neither will I trouble him with a diagram, for every common-sense mechanic must understand the matter. Let us see, however, how near this author is to the correct result. Working on a scale of 1 inch to the foot, let us take 9 inches as half the width of an 18-foot building as a base, and 6 inches, which is one-third of the width, as a perpendicular. Having constructed a triangle in this manner, measure the hypothenuse, which would represent the rafter. If the scale is correctly carried out, the length of the rafter will be found to be 10 feet 10 inches, instead of 10 feet 5 inches. I defy all the architects and wood-butchers there are to make it anything else. I do not lay claim to great wisdom, either.




*Measurement of Stonework.—Fig. 1.—Portion of Wall.*

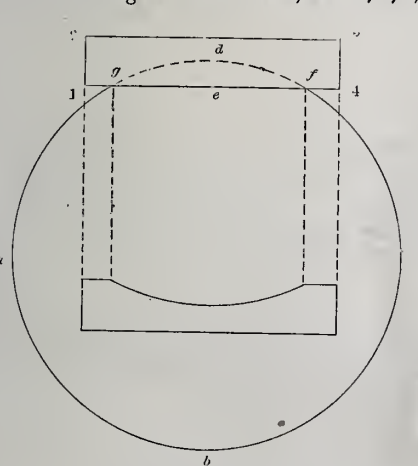
### Measurement of Stonework.

*From* C. A. M., *Cambridgeport, Mass.*—In reply to the question on calculation of masonry proposed by T. N. F., in the November number, I would say that there are in the work 31.62 perches mason's measure and 28.10 quarry measure. The jambs are measured extra by their hights, thus: 16″ x 16″ x 5′ 6″; the window is measured solid. There is no ratio between the two estimates; the difference depends on the nature of the work. A perch is 16.5 x 1 x 1.5 = 24.75 cubic feet (Fig. 1). Nothing extra for four square corners or otherwise except when there are two faces, as in an internal angle (Fig. 2), the same as for a jamb. Bay windows measure double; stone piers also double. If this is not sufficiently explicit shall be glad to make it more so.

*Fig. 2.—Wall with Internal Angle.*

### Rule for Setting Gauge to Saw Lags.

*From* J. F. L., *Lowell, Mass.*—Let 1, 2, 3, 4, Fig. 1, represent the piece from which the lag is to be made, and *a*, *b*, *c*, *d*, Fig. 1, the circle to which it is applied. Ascertain by measuring the distance from *e* to *d*, Fig. 1, and raise the saw above the table the same distance. Let *a d*, Fig. 2, represent back and front of saw thus raised; then, with a radius equal to *f g*, Fig. 1, describe the arc *b c*, Fig. 2, from the point *a*, which represents the back of the saw. Then tangent to the arc *b c* and the point of the saw *d* draw the indefinite line *g f*; then from any two points on the line *g f*, as *g h*, with a radius equal to 1 *g*, Fig. 1, describe the arcs *e i* and *j f*, Fig. 2. Then tangential to the arcs thus described draw the line *k l*, which is the line to fasten the gauge to, *k l m n* representing the straight-edge used as a gauge.




*Rule for Sawing Lags.—Fig. 1.—Showing the Circle to be Lagged and Stuff to be Cut From.*

### Saw Filing.

*From* E. F. D., *Stantontown, Ohio.*—I have noticed in some of the back numbers of the paper articles on saw-filing. Some of the remarks of the correspondents have been quite instructive. Others, to my notion, have been lacking in some of the most important parts. The side bevel and pitch of teeth have not received sufficient attention. Some writers say, hold the file at an angle of 45° for side bevel. This is too much bevel, according to my ideas, for any kind of hand-saw, to say nothing of the pitch or the kind of saw to be filed. I know a saw would not rip very well with such a bevel. It is my habit to file the rip-saw exactly square across, giving as much rake as possible. I claim that hand-saws for cutting speedily the different kinds of wood must be filed differently. This is hard to explain in writing. Some time ago I supposed that I could file a saw as well as any living man. I noticed an advertisement, however, of a saw-file guide, which so impressed my mind that I sent immediately for one. Upon trial, I found it a most excellent thing. I learned more about saw filing with it in one day than I had learned before in ten years. A saw must be jointed square to run straight. This can be done easily and quickly by taking a strip of soft or hard wood (surfaced out of wind) 1 or more inches in thickness and about 12 inches long. Joint one edge square with face. Run the plane along the corner, taking off a light shaving, so that it will not interfere with the set. Lay a flat file on the edge of the strip. Hold firmly; also hold strip against the side of saw; then joint from point toward handle until straight. The special advantage of the saw guide to which I have already referred is that, by its assistance, every tooth in a saw is filed to the same bevel and pitch. By this means all the teeth are kept the same size and give the best possible effect.

Much has been said by writers on saw filing about the manner of holding the saw. Some say, hold toward the point; others say, toward the end. Some have asserted that a saw will not cut well filed against the grain, to use an expression. I claim a saw will cut just as well when so filed, the only difference being that it is harder to file it in that manner. I would not advise filing against the grain on this account. There is no tool used which is in so bad condition in nearly every case, and so little fit to do its work, as the saw. All this is from the lack of an easy and sure means to keep the tool in good order. It is a pleasure to do work with a saw when in good condition; it is hard work to use it when it is in bad order. It taxes patience and body to an alarming degree, besides causing a loss of time.

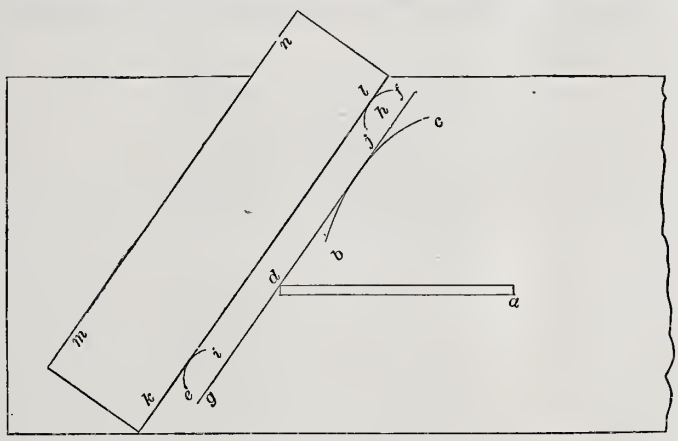


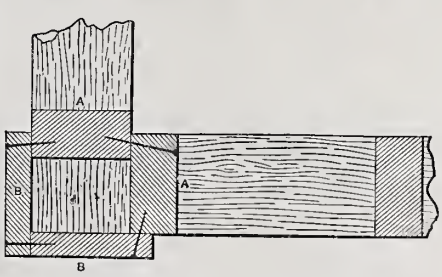

*Fig. 2.—Showing Position of Gauge and Saw.*

### Brooklyn Schoolhouse Competition.

*From* E. S. H., *Albany, N. Y.*—After reading the notice of the Brooklyn schoolhouse competition in the September number of *Carpentry and Building*, I wrote to Mayor Low for the full requirements of the competition. The printed conditions which I received were substantially the same as published in your September issue. With the addition, however, of the following clause: "No plans returned." Not understanding the meaning of this clause, I wrote for an interpretation. The explanation I received was to the effect that all drawings for the competition, when received at the Mayor's office, became the property of the committee. This condition seemed so unreasonable that I did not enter the competition. As others were doubtless influenced by this same condition, it should in part explain why the competition was not a success. The inexplicable thing to me is, why even a single set of drawings should have been submitted under these conditions.

### Framing Corner Posts.

*From* J. A. E., *Cowan, Tenn.*—As it is desirable to arrive at the very best practical knowledge from discussions through your columns, I will submit my plan of framing corner posts, in studding frame houses. It commends itself for economy, strength and real merit. It will easily be understood from the accompanying sketch, A A representing the corner studs, set 3 inches and 4 inches from the corner respectively for a 4-inch wall, and spiked together as indicated, B B the corner boards, nailed as indicated, forming a hollow corner, the hollow space being at C. By using one stud, 3 inches by 4 inches, the corner boards may be equalized or made to show equal face on side and end of building, as they should.

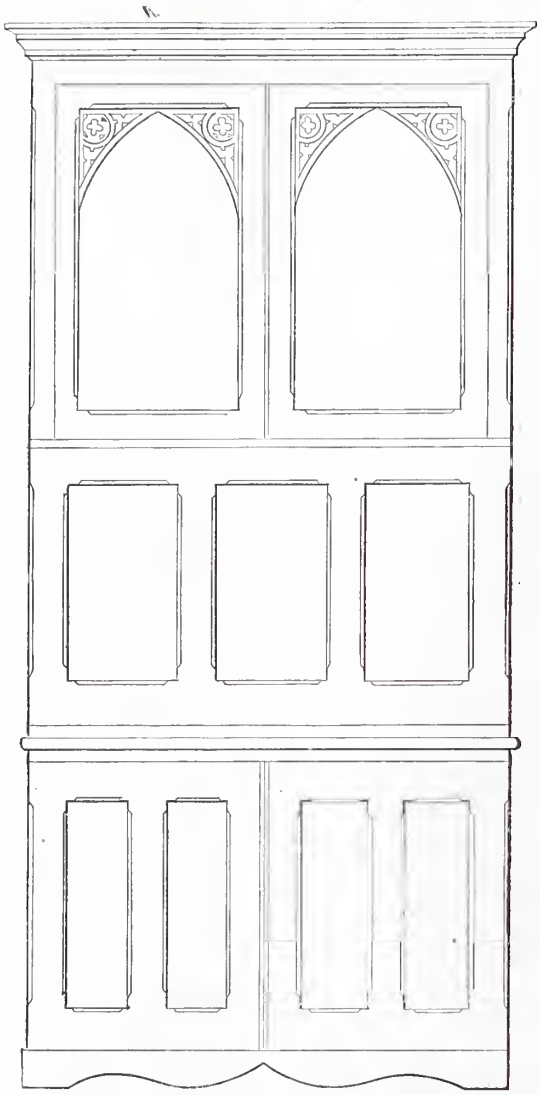



*Framing Corner Posts.*

### The Square in Framing.

*From* G. L. M., *Kingston, Pa.*—I like to see a journal like *Carpentry and Building* made as plain as possible. Referring to L. P. B.'s description of how to get the length of rafters, published in the January (1882) number, I would say that I am of the opinion that there are some in the trade who will fail to understand his meaning. I make no pretensions to being a thorough mechanic, for I have followed the trade but a short

time, comparatively. As for the rule or use of the square for getting the length and bevels of rafters, I made the discovery myself without a hint from any one. I find the method of so much value that I want to send my description, for the benefit of those who may be interested in it. I first discovered that the distance from 12 on the face side of the blade of a square, diagonally across to 12 on the outside tongue, is the exact length of a brace for a 1-foot run, and that it might easily be measured with the pocket-rule. Next, I saw that the length of a brace for a 2-foot run is twice the length of that for a 1-foot run. Further, that the length of a 3-foot run and a 4 foot run is respectively three times and four times the length of a brace for a 1-foot run. I also saw very soon that I could, without my rule, get these lengths just as well by laying the points 12 on the square exactly to the edge of the stick



*Bookcase and Secretary.—Fig. 1.—Front View, Completed.*

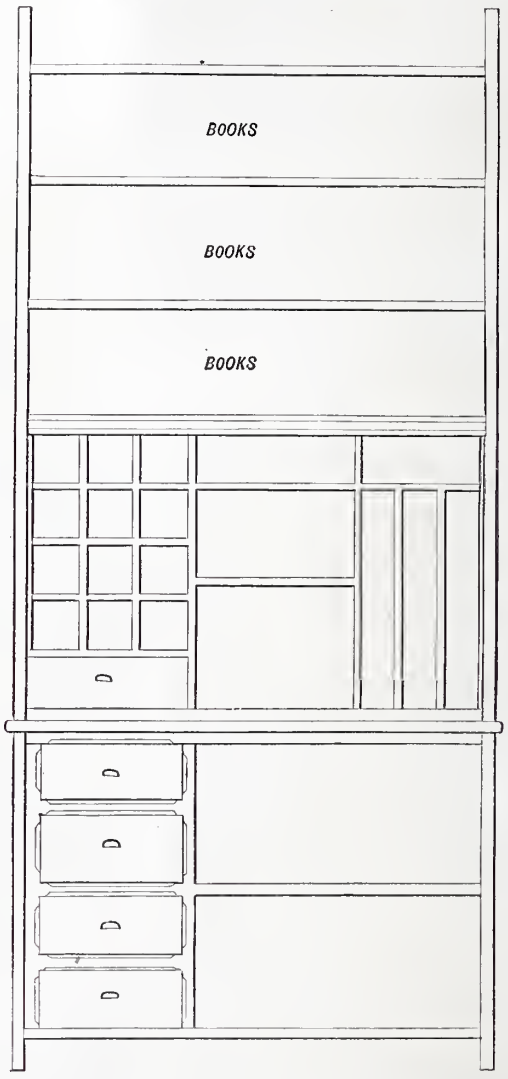



*Fig. 2.—Front View, Showing Framework and Divisions.*

to be cut; and, marking each one, the lengths could be transferred to the timber more easily than by measuring with the rule. That is, lay the square in such a way as to mark for a 1-foot run; then move the square along and mark again, and so repeat as many times as there are to be running feet on the girt or post. The side of the square will cut the bevels at each end.

It is hardly necessary to add that this rule applies only when the run is equal on the base and girt and at right angles; when the run is unequal, the principle is the same as getting the length of rafters.

### Building a Brick House Over a Spring.

*From* SUBSCRIBER, *Alexandersville, Ohio.*—I would like to know the best method of constructing a brick house, on the site where there is a running spring that will be in the cellar, so as to prevent dampness. Although the present house is frame, the rooms immediately above the cellar always smell musty whenever the doors and windows are closed. The occupants have been healthy, and for 50 years the place has been remarkably exempt from diseases that have prevailed in the neighborhood. Unless there be objections to the spring in the cellar, the location is in every way most suitable for a dwelling. There is also a spring of excellent water within a few feet of the house, but the ground is high and well underdrained by a gravel subsoil.

*Answer.*—We cannot determine from our correspondent's inquiry whether it is the desire of the owner to preserve this spring in the cellar for use, or whether he merely wishes to know how to build so as to avoid any trouble which it might occasion by making the cellar wet. If, as we find in many country houses, the owner desires to retain the spring in the cellar, he can probably do so without serious risk if it is properly inclosed and has suitable provision for carrying away its overflow. The cellar bottom in this case should be impervious to water, and any bricks used in the foundation should be as hard baked as can be had, and preferably treated with coal tar before laying. As the ground under and about the house is no doubt springy, as shown by the fact that there are two living springs within a few feet of each other, it would be well to face the outside of the foundation with asphaltum, and to provide a damp course of blue flagstone or slate in the foundation. If the owner does not want to use the spring, but merely wishes to know what to do with it, we should say it was a very simple problem in engineering to so pipe it as to carry away the water, if it has fall enough at front or rear to give it an outlet. In this case the drain, which should be of good glazed tile, well laid with cement joints, should be kept well below the cellar bottom and given all the fall that can conveniently be secured. If there is a good spring within a few feet of the house, we should think it much better to dispense with that in the cellar, especially as it has created dampness in the old house for so many years.

### Design for Bookcase and Secretary.

*From* L. R., *Highland Falls, N. Y.*—In response to G. W., of Marysville, Mo., I send you for publication the plan of my bookcase and secretary that I have just completed. It is built of black walnut. The lower doors and lid are paneled, and the upper doors have glass instead of panels. All the inside work is made of white wood faced with black walnut. After sandpapering the work with No. 0 sandpaper, I gave it three coats of Berry Bros'. hardwood finish. The whole thing, if neatly done, makes a durable piece of furniture. Fig. 1 shows a front view of the complete article. Fig. 2 is a front view, showing the framework and divisions. Fig. 3 is a side view, while Figs. 4 and 5 are details of the ornament for door panel and crown molding, respectively. The illustrations clearly show, I think, the construction of the article, without a more extended description.

### Iron Window Frames.

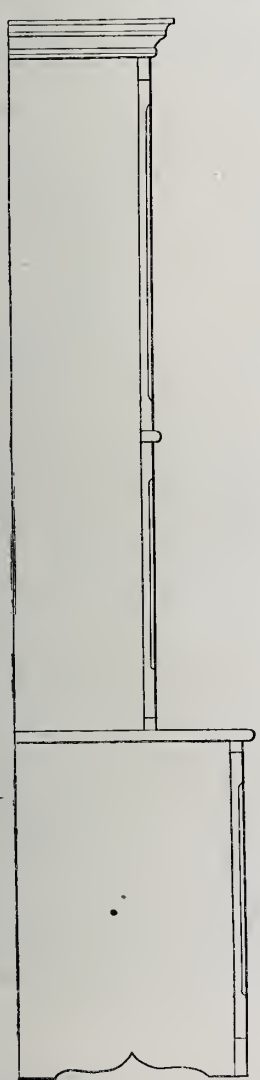
*From* G. P. P., *Attica, Ind.*—I wish to obtain some information concerning iron window frames, if there is any objection to them on account of expansion and contraction. I also wish to know where they are manufactured. I am at present preparing plans for a house which will cost about $5000, in which it is desired to use iron frames.

*Answer.*—We do not know that there is any objection to the use of iron frames on account of expansion and contraction. Whatever difficulty exists in this direction may be easily overcome by the method of construction. We would suggest to our correspondent, however, that there is no advantage in employing frames of this material,

unless the building he is putting up is to be fire-proof in all particulars. If there is woodwork to be used in other parts, such as floors, doors, trimmings and the like, nothing will be gained by employing iron in the window frames. We throw this out as a suggestion, because the additional expense is quite an item, and it will be practically thrown away unless other parts are made to correspond. Concerning parties who make work of this kind, we would say that almost all architectural iron works in the country give more or less attention to it in the way of contract work. By addressing Messrs. Cheeney & Hewlett, 203 Broadway, New York City, our correspondent may obtain additional information.

### Labor Economy.

*From* J. L. P., *St. Joseph, Mo.*—A correspondent in one of last year's numbers sets forth his views upon the subject of labor economy. When he takes the posi-



*Design for Bookcase and Secretary.—Fig. 3.—End View.*

tion, as he does, that the supply of skilled labor is increasing faster than the demand for it, I am strongly inclined to think he is mistaken. The argument advanced to support this theory is that labor power has increased 54 times in the last 100 years, while wages and interest have remained stationary, and that land alone has swallowed up all the profits. It is a fact, which every one who gives the subject of labor economy any degree of reasonable thought will admit, that labor power will not increase faster than the demand for it. Labor-saving machinery is improved as the exigencies of the times demand, and skilled labor is even more in demand today than at any former period in the history of civilization. It only requires a study of the history of improvements in machinery and the advancement of modern civilization to convince any intelligent mechanic that there is no danger of labor power increasing faster than it can be employed. Demand and supply are coexistent. As demand requires, the supply is furnished by an increase of labor power. The relations one to the other of demand and supply are the same, working as properly adjusted machinery always works. Both rise or fall together,

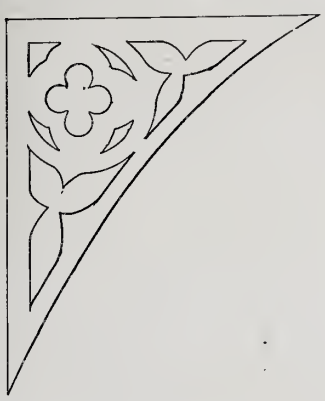


*Fig. 4.—Detail of Ornament for Door Panel.*

thereby precluding the possibility of a great excess of either one over the other. The demand is greater at the present time than ever before. While industry is making vigorous and rapid strides in advances, mechanics are following more leisurely. It is, however, mainly due to defective education, or, I might say, to a lack of scientific training in the common schools. Of this, however, it is not necessary to speak in this connection.

Wages are greater now than they were 100 years since. Interest is greater now than 100 years ago. The increase of land value proves the latter, while if your correspondent will take the pains to look a little deeper into the subject of labor economy, he will find the former as I have stated it. Were this not true there would be no advancement, since land is the basis of value. As this great foundation of value increases, so do industries expand. If labor power did not increase with the general progress there would be no

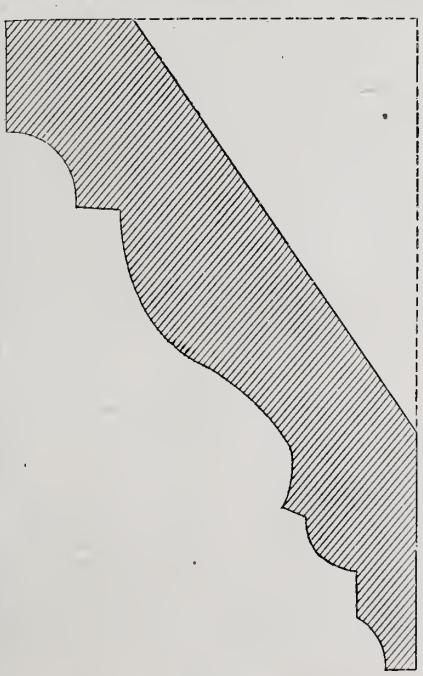


*Fig. 5.—Detail of Crown Molding.*

material advancement in industry. The value of land would not advance. There would be no demand for labor, skilled or otherwise, and the vast machinery of our industrial progress would stop simply for want of motive power.

Your correspondent, to prove the matter practically, should invest the earnings of his labor in land, and through that investment receive a greater interest than did his great-grandfather 100 years ago from the same amount so invested. The demand is greater now than it was a century ago for skilled labor; hence the greater necessity for educated mechanics. While a master of his trade can always find employment, perhaps the more careless ones—the class who have learned their trade supposing that is enough for them—will, to some extent, be crowded out. Therefore I fail to see the wisdom of any one who may have discovered means or methods whereby he can more speedily execute work, refusing to give it to the great body of working and thinking mechanics simply for fear of making too many carpenters. There is a tinge of egotism in the man who for one moment supposes that he can keep secret in his own mind anything of practical utility from this wide-awake and progressive age.

### Carpenters' Wages.

*From* A. M. B., *New York.*—In an early number of *Carpentry and Building* for 1882, a warning was given to carpenters with reference to advance in wages, and something was said about killing the goose that lays the golden egg. A little later the fact was mentioned that carpenters had taken some steps in a direction that seemed unadvisable. We did what we were advised not to do. At present we are getting wages unprecedented in the history of the trade in this country. Through our action scarcity of work and stopping of building operations is only a question of time. It is needless for me to explain to the readers of the paper that my language above is somewhat scarcastic. I approve the course of the carpenters in the action that they have recently taken. Wages are the last to go up. Rents advance, provisions cost more, but wages are never raised until an effort is made. Those who have not experienced the privations of a workingman in a large city cannot know anything about the difficulty of getting along, and how poor a living is afforded by the wages he ordinarly earns. It seems to me that carpenters by their recent efforts have only obtained what is justly their due.

*Note.*—Our correspondent, in forwarding a letter, the principal portion of which we print above, remarked that he did not expect to see it printed. While the subject is one we do not consider it our special mission to discuss, having uttered what we considered a proper word of warning to our readers some time ago, we have thought right to let this expression appear in our columns. We were sincere in our advice to carpenters and mechanics generally, and we see no reason at present to change opinions already expressed. We are in favor of mechanics receiving the highest rate of wages in reason, and in the abstract we are free to admit they are getting no more at the present time than they are entitled to. It is simply a question of method and time. No one will rejoice more with the prosperity of the craft than ourselves, or be more willing to sympathize with it in case ill-advised action brings disaster.

### Cheap Paint.

*From* C. S. K., *Wakefield, Mass.*—I send you herewith a recipe for a cheap paint that will wear equal to lead. Take equal parts of linseed oil and water, 1 pound of whiting and 2 pounds of zinc. Dissolve a small amount of potash in as little water as possible, and after mixing the above ingredients together add just enough of this solution to the paint to cut the oil and water so that they will mix. To mix the paint, put in the whiting and zinc, then add the oil and water until it is of the right consistency for use. If the paint spreads, add a little more potash. Keep the brush dry when not in use. It will not harden enough to give any trouble if kept dry, but if put in either oil or water it will become very hard. For the second coat put in less zinc and more whiting. Any shade can be obtained by putting dry color in place of the whiting. This paint has been used on a building beside white lead, and after being on seven years looks better than the lead. It spreads very easily and covers more surface than the same quantity of lead.

*Note.*—We print this letter as a curiosity, but do not hesitate to say that we consider it entirely misleading. There is no reason, chemical or other, why a paint made after

this recipe should have any value whatever except that due to the oil in it, and even the use of the oil is diminished in proportion to the extent to which its character is changed by the addition of potash and water. We also fail to see why if the brush will not become hard in the air we could expect this paint to ever become hard by the usual process of drying, which, as our readers probably know, is affected simply by the oxidation of the oil used as a vehicle. In some parts of the country there is a tradition that very excellent paint can be made from road dust and buttermilk, and it is very largely employed in painting barns and fences, but we should never think of recommending it as good paint or equal to lead. The fact that paint made after the recipe of our correspondent will look better after seven years' exposure to the atmosphere than lead paint alongside of it, is probably less surprising than it sounds, for as to this we should want to know something about the lead used, and whether what was called white lead paint was anything more than barytes and fish oil.

### Putting Up Block Trim.

*From* S. K. F., *Camden, N. J.*—From what I can understand from the question proposed by F. A. R. some time ago, he wishes to know how to put up block trim. He says "finish." I don't understand the meaning of that term in carpentry. I imagine, however, that it takes the place of the word trim. If so, I can probably give him the information that he requires. I have trimmed a great deal with block trim. The lower pieces of trim are called base blocks; next come the casings which rest on them, then the corner blocks which take up the space in the corner of the work where otherwise the casing head and stile would butt or miter. The proper way to put up such a trim is as follows: The base block being of the desired hight, nail it on flush with the jamb. Next cut the casing square, so it will make a good fit on the base block. Rest it on the block, and mark with the face of the head. Cut the casing square, and nail it in place. A full 1-16th inch margin from the jamb should be allowed. Do the same with the opposite side; then take the head casing, cut it square on one end and hold that end flush with the face of the jamb stile. Mark the opposite point on the head, cut square and nail in place. This will leave a square in the two corners of the trim into which the blocks are to be fitted. In some cases more difficult trim is encountered than has been anticipated in these directions. It often happens that the casing is an inch wider than the corner blocks, the base blocks remaining the same. In such cases it is necessary to nail on the base blocks as usual, just as though the casing were flush with the jamb. Rest the casing on the block, and mark with the face of the jamb head, but instead of cutting it, miter it; then find out how wide the block is, and square across from that point and cut off. By this construction the block will show at the corner for different-sized heads, while a miter will form the junction between the casing and head in the portion not occupied by the block. After both sides are nailed in position, mark the head and miter it, and cut square in the same general way as described with the casing. If it is desired to cope instead of mitering, then it is necessary to cut the stile casings as before, and cope in the miter a full ¼ inch. Miter the head ⅛ inch longer on each end. In case the pieces are coped before the square part is cut, it is best to rest the head on the stile and square up from the cut on the stile.

### Construction of Roof.

*From* W. P. H., *Winchendon, Mass.*—I contemplate building a storehouse 30 by 30 feet, and from 18 to 20 feet high, and wish to save the rain-water. What objection is there to having a valley in the center, and running the rafters from the sides down to it, so as to have the water conductor in the center of end? How little pitch will probably drain a painted tin roof? Is there no better roof to use in this place? I wish to know if wire lathing properly applied on the outside of this building and plastered three-coat work—first rich lime mortar, then part cement, and finally finishing in cement and blocked to imitate stone—would make a durable covering in this cold, wet, changeable climate?

*Answer.*—The objections to a valley in the center of a roof of the general shape described by our correspondent arise for the most part from defects in the construction, and the liability of the roof to give trouble on account of the freezing and thawing which takes place in the winter season. Where the roof covering is of the very best quality and entirely tight, and where the conductor pipe leading from the roof to the cistern can be kept warm, so that it will not clog with ice, there is far less objection to this construction than in other cases. Supposing, for instance, that our correspondent constructs the roof in the maner indicated, and that the conductor pipe becomes clogged with ice, so as to hold the water on the roof, backing it up to any depth according to the amount of rain which falls. It will be seen at once that he has constructed a box for holding the water, and that the supports of his roof will at once be taxed in a very unexpected manner. Difficulties of this kind are avoided where the conductor pipe is kept warm enough to prevent freezing. It is for reasons of this general kind that the construction which places the gutter outside of the walls is almost universally employed throughout our Northern cities. If the gutter is outside of the wall, any overflow caused by ice or snow in the gutter, any bursting of the spout caused by ice within it, and difficulties arising from other similar causes, do very little damage because the water falls clear of the building.

With reference to our correspondent's second inquiry, we cannot answer from experience. We doubt, however, the plastered surface giving entire satisfaction in the climate where his building is located. Plastered outside walls are largely employed in warm climates, and, so far as we know, answer a good purpose; but we have not known of their being entirely satisfactory in Northern climates. Perhaps some of our practical readers may be able to answer further as to these points. If so, we shall be pleased to have their letters.

### Staircase of the Pennsylvania Railroad Station in Philadelphia.

*From* A. H. M., *Philadelphia.*—In a series of articles headed "Notes and Comments," in your November issue, is one on "Want of Forethought in Architecture," also one on "Proportion in Architecture," in both of which references are made to the staircase at the Broad street station of the Pennsylvania Railroad Company, in this city. The criticism made, and I think well made, is that in a flight of such great width the usual proportion of tread and riser cannot be adhered to without giving the appearance of narrowness to the treads and consequent insecurity to the whole flight. While agreeing with the views here expressed, I wish to state that the stairs referred to were originally designed with three hand-rails, dividing the going into four widths of about 8 feet each, together with a wall-rail at each side. With this arrangement the proportion of steps (6⅞ x 11) would have been ample, and appeared quite safe. From this you will see that "want of forethought" cannot be charged against the architects in this matter. The dimensions of stairs as given in your article are much too great, the hight being only 15 feet 6 inches instead of about 28 feet, and the total width 32 feet instead of 50 or 60 feet.

### Estimates.

*From* BUILDER, *Middletown, Conn.*—I have read with great interest the correspondence department of *Carpentry and Building*, and have often found in it wrinkles that are instructive as well as amusing. In the September number, J. I. M., of Westerly, R. I., writes with regard to a list from which he can make estimates. I should suppose that every architect's specification in connection with a set of plans ought to be sufficiently explicit to obviate the difficulty this correspondent deplores. If the specifications are not sufficiently explicit, I cannot understand how they can be safe guides for the performance of the work they represent. It would seem to me to be a tedious operation to run through a list such as your correspondent suggests, because of the variety and extent of the builder's work. I suggest that, when estimating, the builder make a memorandum under each head of all the materials that could possibly be required in that part of the work. A habit of attention to the details will remind him of the things usually omitted. Your correspondent says that he finds every one has to be very careful in estimating, or else something will be omitted. That is just the point. It will never do to be careless in making estimates. It is only the careful men who are successful. Form the habit of thinking out the details of an estimate, rather than depending upon a list that may be mislaid just when you want it. A builder should have a list of the generalities in his mind, because particular things are usually brought to the front in the specification. I have adopted a wrinkle that, so far as I am acquainted with the practice of architects, is original with me. It is that of indexing the headings on the face of the cover of the specification, as follows:

MASON'S SPECIFICATION—INDEX.


| | Page. | | Page. |
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| Areas | 5 | Foundations | 4 |
| Brick | 6 | Furnace flue | 7 |
| Coal chute | 6 | General notes | 1 |
| Chimneys | 7 | Grading | 4 |
| Cements | 5 | Hatchway | 5 |
| Cellar bottom | 8 | Lathing | 9 |
| Cistern | 9 | Mortar | 10 |
| Cesspool | 9 | Notes | 2 |
| Drawings | 1 | Plastering | 10 |
| Drains | 8 | Piers | 6 |
| Excavation | 3 | Partitions | 6 |
| Footings | 4 | Underpinning | 5 |
| Fireplaces | 8 | Ventilators | 7 |


### Cracking of Plaster.

*From* E. M. H., *Mazomanie, Wis.*—A correspondent from Chetopa, Kan., wants to know the cause of his plaster cracking. I think I can tell him. I have met with the same difficulty, and have heard the same story from plasterers about the old way being out of vogue and an exploded idea. My experience has been that wherever that idea has exploded it has cracked the plastering. The cracking is caused by the swelling of the woodwork from the moisture of the plaster coming in contact with it. If the brown mortar is allowed to get thoroughly dry, and the woodwork time to dry out, all the cracks are made that ever will be made. When the hard finish is put on it covers these cracks, and there will never be any cracks made save those caused by the settling of the walls. It is very much less work for the plasterer to hard finish on green walls than on dry walls. This is the reason why the old custom is out of vogue. I have never yet seen a job finished green that did not crack. I like to have my brown mortar put on in the fall. I then put on the outside finish during the winter, and have the hard finish applied to the walls in the spring.

*From* W. P. H., *Winchendon, Mass.*—Concerning J. M. B.'s trouble from plaster cracking, I would say that if the cracking is owing to swelling and shrinking—that is, if it is lengthwise of the lath—it might possibly be prevented by allowing the first coat to get entirely dry before the second coat was applied. This plan of plastering is not entirely out of vogue where a really good job is wanted. It costs a little more, and on this account is not used so much as formerly. If the cracking was only in the finishing coat—that is, if it is what we call "chip" cracking—it was probably owing to the finish being too strong in lime, or possibly it was not worked down hard enough with the trowel and brush or both.

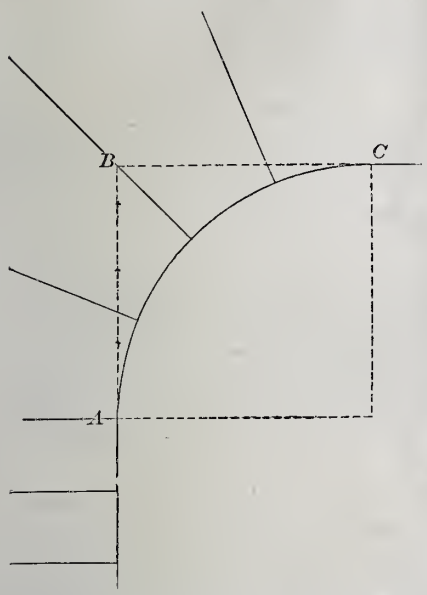
### Painting Shingles.

*From* P. E., *Waynesville, Ohio.* — With regard to defective shingles, I desire to say, for the benefit of G. J. and others, that painting will not help them. The paint forms a ridge at the butts of the shingles and tends to rot them much sooner than if unpainted.

I have seen the experiment tried, and speak from practical experience. I do not think that painting can be made of any benefit to the roof unless it is applied at the time the shingles are put on.

### Question in Stairbuilding Answered.

*From* J. W. H., *Union City, Ind.*—Will wreath-pieces having rakes and level tangents over quarter-circle ground plans be the same over quarter-circle ground plans with




*Question in Stairbuilding.—Fig.* 1.—*Ground Plan. Quarter Turn with Winders.*

winders in the same taking up at least three-quarters of quarter-circle, with level landing over floor line at the top of the stairs having a quarter turn at landing?

*Answer.*—The above question in stairbuilding seems to afford an opportunity for making known some of the principles involved in practical work. The writer, as we understand him, desires to place the winders so that the rake line of the rail on the straight flight will meet the center line of the level rail on the landing. We answer that this can be done, but there is no occasion for it unless the mechanic is only able to produce that particular kind of a crook.

The winders thus drawn, as shown in Fig. 1, would be out of all suitable proportion to the straight steps. To explain: The base line for the raking tangent of wreath-piece would require to occupy the width of 3½ treads of the straight part, plus the distance from face of riser to center of short baluster. It would then naturally meet the center line of the level landing rail. A better way to plan the stairs is shown in Fig. 2. In this plan the cylinder is drawn considerably smaller, so as to make the ends of the winders about half the width of the ordinary treads, thus bringing the steps into better proportion. The wreath-rail is made in two parts, the first covering from A to C, with some additional straight wood at the lower end to assist in forming an easement, the second covering the remainder of the quarter-circle and joining the level rail at E.

To draw the patterns for this rail, first draw the tangent B C D at an angle of 45°, meeting the center lines of the straight rail produced at B and D. Draw the elevation A B *b*, representing the pitch of the rake line on the straight flight. Draw the hight line D *d d* equal to 3½ risers, plus the ordinary hight gained on the straight flight in passing from face of riser to center of short baluster. Draw B *p* parallel with D *d* and equal to the first elevation B *p*. Extend D B to O, and draw O A at right angles. Now, through *d* and *p* draw the rake line *d p l*, and draw *l* o at right angles with *d l*. A O and O *l*, respectively, form the base and altitude of a triangle shown at the left of the figure, and whose angle at *l* is the plumb bevel for the upper end of the first wreath-piece at *c*. The bevel for the lower end may be found by drawing an elevation on the opposite side of the figures, as follows: Draw C *n* parallel with A B, meeting the spring line A I at right angles. Draw the perpendicular C *t* equal to C *c*. From *t* draw *t m* on the same pitch as A *b*. Draw *a m* at right angles with *t m*. Now, A *n* and *n m* are the base and altitude respectively of the triangle shown at the right of the figure, forming at *m* the plumb bevel for the bottom end of the first wreath-piece. The face pattern is shown at the left of the figure.

On the pattern, *c p l* is the same as *c p l* in the elevation; *l* A is equal to *l* A on the top end plumb bevel; A *p* and *p c* are the tangents. A *a* is added for straight wood. The bevels both apply from the top face and inside corner of the piece. The triangle C *d* D is the elevation plan of the first or raking tangent of the second wreath-piece, the hight D *d* being the remainder of the whole hight gained in passing from A to E, or, if reckoned on the tangent lines, of the hight gained in passing from A to D. The tangent over D E is of course level, and joins with the level rail on the landing.

To draw the plumb bevel for the top end, make E *e* equal to the hight D *d*. Connect *e u*. The angle at o is the bevel required. To obtain the bevel at the lower end, draw E G parallel with D C. Draw G *r* at right angles with C D. Draw *r s* at right angles with C *d*. G *r* and *r s* are the base and altitude respectively of the triangle shown above the figure, and whose angle at *s* is the plumb bevel of the lower end of the wreath-piece. On the face pattern shown below, C *u* equals C *u* in the plan, *u e* equals *u e* in the plan, *d e* equals D E. The raking tangent is the line which connects *d* and *c*. Both bevels apply from the top face and outside corner of the piece. Both patterns are drawn of an equal width throughout, and somewhat wider than the greatest diameter of the rail. The curves are drawn by bending a flexible strip and starting square with the butt joints at either end.

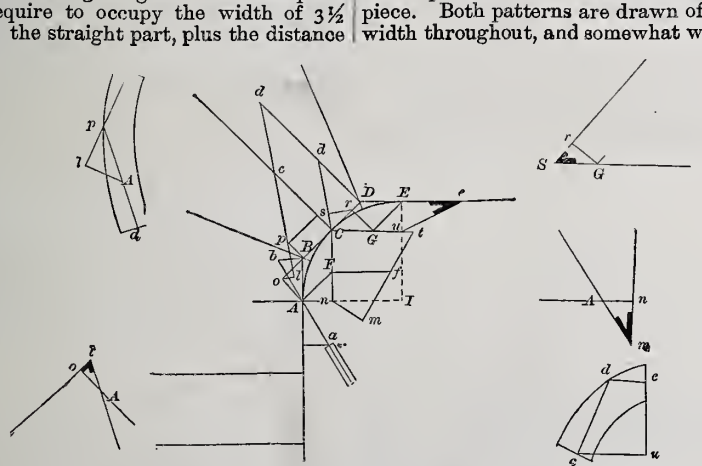


*Fig.* 2.—*Ground Plan, Showing How Winders May be Reduced.*

### Labor and Capital.

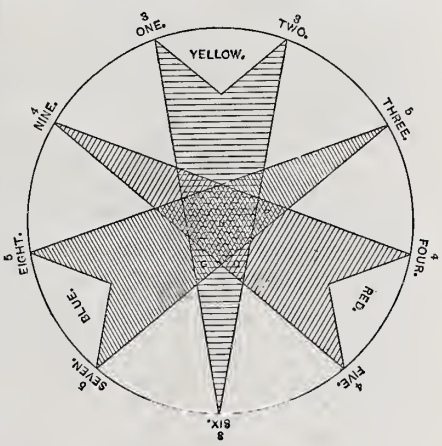
*From* S. G. R., *Grand Rapids, Mich.*—I will venture a short reply to R. B., of Columbus, Ohio. He raises the question, Where do the gains go? and makes the assertion that capital does not get it, but that it goes to increase the value of land. It seems to me that this indicates that capitalists do get the gain. Whether the gains are invested in land or stocks does not concern me. I am concerned, however, that there are so many of the stamp of this correspondent who have charge over men who are better than themselves. All are familiar with the story of the dog in the manger. I am not a stairbuilder, but I do call myself a mechanic. Any rules which I know concerning work in carpentry are at the service of my fellow-workmen. They can have them and welcome for the asking.

### Boring a Square Hole.

*From* C. H. L., *Fitchburgh, Mass.*—In answer to the question of W. H. R., of Ogden City, who asks about boring a square hole, I would say that a square hole can be bored with a round bit in one way only. Anything that can be folded in two ways can be bored by starting the bit on the corners where it is folded. After the hole has been made, it will be found on unfolding that it is square. There is a boring machine in the market provided with a chisel attachment that makes a square hole, and which is very convenient for mortising.

### A Mathematical and Orthographical Coincidence.

*From* J. C. R., *Mount Vernon, N. Y.*—Your correspondent D. F. H.'s "Characteristics of Figure 9" reminds me of a curious discovery I made in a desultory play with figures 40 odd years ago—a very remarkable mathematical and orthographical coincidence relating to the nine digits, and which the diagram




*Mathematical and Orthographical Coincidence.*

herewith will serve to illustrate. Observe the three arrow-heads, the names of the digits in regular succession, and the numerals indicating the numbers of letters in such names respectively. At the three points of each arrow-head occurs the same numeral, whether it be 3, 4 or 5. The sum of the number of letters in the names of the digits equals 36—a multiple of 9; 3, 4 and 5 are proportions of lines which will form a right-angled triangle, &c. By coloring the arrow-heads with the three primitive colors, red, yellow and blue, we have besides four of their combinations, orange, green, purple and nondescript.

### Sides of Octagon Bay Windows.

*From* V. E. S., *Lisbon, La.*—In reply to J. D. S., I will state that if he will get a slide rule he will find that by means of it he can lay out the sides of octagon bay windows with absolute accuracy.

*Note.*—This advice from our correspondent would undoubtedly be of greater interest to the one making the inquiry if it had been accompanied by specific directions. The slide rule almost every one has heard of, but its practical applications are few and far between. If our correspondent sees fit to address us again upon this subject, showing by means of illustrations and descriptions just how the operations referred to may be performed by the aid of the slide rule, he will undoubtedly interest many of our readers.

### Legal Qualifications of an Architect.

*From* E. J., *Detroit, Mich.*—Could you inform me if it is absolutely necessary in point of law for an architect to be a regular graduate of some technical college or to be regularly articled to an architect for a given term, in order to give him a professional standing, as in medicine and law. If so, how long a course must those studies reach?

What is the general percentage for plans, specifications and superintendence for general work?

*Answer.*—The only qualifications that are absolutely necessary for the practice of the profession of architecture consist of a drawing-board and a T-square. It is not even essential that the architect should know anything whatever about architecture, as a great many of them do not, but manage somehow to make a good living out of it. We would say, however, in reply to our correspondent, that some knowledge of the principles of designing and construction is desirable, and that the practicing architect would find it convenient to know at least the elements of business. However, if he chooses to practice without any such preparation, there is nothing to hinder his doing so, and his professional standing will usually be found to depend upon the extent to which he can impress the public with a sense of his talent and capacity.

In reply to our correspondent's last question, we present herewith the charges of architects, as indorsed by the American Institute of Architects:

For full professional services, including superintendence, 5 per cent. upon the cost of the work.

*Partial Service as Follows:*

For preliminary studies, 1 per cent.

For preliminary studies, general drawings and specifications, 2½ per cent.

For preliminary studies, general drawings, details and specifications, 3½ per cent.

For stores, 3 per cent. upon the cost, divided in the above ratio.

For works that cost less than $5000, or for monumental and decorative work and designs for furniture, a special rate in excess of the above.

For alterations and additions, an additional charge to be made for surveys and measurements.

An additional charge to be made for alterations or additions in contracts or plans, which will be valued in proportion to the additional time and services employed.

Necessary traveling expenses to be paid by the client.

Time spent by the architect in visiting for professional consultation, and in the accompanying travel, whether by day or night, will be charged for, whether or not any commission either for office work or superintending work is given.

The architect's payments are successively due, as his work is completed, in the order of the above classifications.

Until an actual estimate is received, the charges are based upon the proposed cost of the work, and the payments are received as installments of the entire fee, which is based upon the actual cost.

The architect bases his professional charge upon the entire cost to the owner of the building when completed, including all the fixtures necessary to render it fit for occupation, and is entitled to a fair additional compensation for furniture or other articles designed or purchased by the architect.

If any material or work used in the construction of the building be already upon the ground or come into possession of the owner without expense to him, the value of said material or work is to be added to the sum actually expended upon the building before the architect's commission is computed.

Drawings, as instruments of service, are the property of the architect.

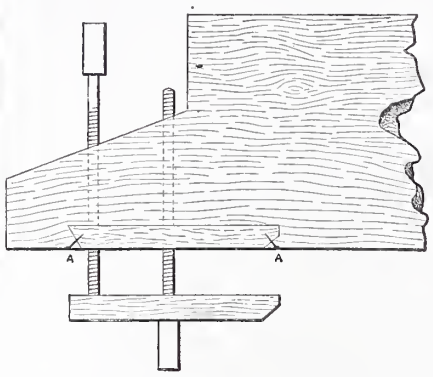
### Plan for a Flat.

*From* J. H., *Worcester, Mass.*—Please give me plan and specifications for a New York flat or apartment house, as I have a chance to build one six stories high in our city as soon as I can get a plan that suits the party.

*Note.*—We doubt if we could give our correspondent a plan for a six-story apartment house that would please the owner, or that he will ever get a plan if he waits until he can pick one up ready-made. As an indication of how apartment houses are built in New York, we would refer him to the issue of *Carpentry and Building* for January, 1880, and in adopting the principle there shown, and the conditions existing at the point where the proposed six-story building is to be erected, we would recommend him to secure the help of a good architect.

### Improvised Vise.

*From* O. E. M., *Nashville, Tenn.*—I send you a sketch that some of your readers may find to contain a useful hint. I was working in the country lately and needed a vise. Not having one at hand I improvised one in the manner shown. I took a clamp or hand-screw and put one jaw on backward, beveling the back of square end



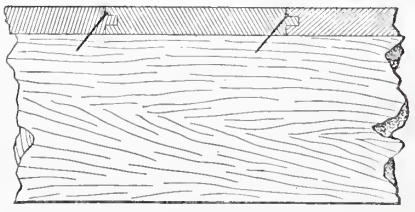

*Improvised Vise.—By O. E. M.*

and fitting it in flush with the edge of the bench top, putting a screw in each end at A A to hold the jaw in place. I found it made a good substitute for a vise without impairing the usefulness of the clamp.

### Blind Nailing.

*From* R. J. D., *St. Paul, Minn.*—Will you kindly describe to me blind-nailing? I am working on a job that is to be blind-nailed, and am at a loss to know how to do it. I hope you will give me full particulars about it.

*Answer.*—The process of blind-nailing is so extremely simple and so essentially a part of every carpenter's knowledge that we are rather surprised to receive the inquiry. We assume, however, that it is made in good faith and that our correspondent really desires the information he asks for. The term blind-nailing expresses, without any need of explanation from us, what is intended to be accomplished by this method of securing pieces in place. How blind-nailing is done,



*Blind Nailing.—Reply to R. J. D.*

in case of flooring, is shown in the accompanying little drawing, which our correspondent will readily understand. It is usual in blind-nailing flooring or wainscoting to put in the nail wherever there is anything for it to hold to, and to nail only through the outside edge of the board last placed in position. The inside edge of each board is held in place simply by the tongue and groove. The nail is driven with a hammer as far as it will go without danger of injury to the edge of the board, and it is then set in by means of a nail-set. When the stuff to be blind-nailed is not tongued and grooved the nail is merely driven through the edge at about the angle shown in the drawing. In the absence of tongues and grooves, the stuff so put together is usually held in place by means of moldings, as in bath-tub finish and such work.

### Lath for Plastering.

*From* S. K. F., *Camden, N. J.*—In reply to the question asked by C. M. A., some time since, I would say that damp or wet lath is better for plastering than dry ones. A lather would much less prefer putting on wet lath than dry ones. A plasterer would sooner press his mortar against wet lath than against dry ones. In evidence of this it may be mentioned that in a repair job a plasterer, after he has torn away the old mortar, will take a brush and sprinkle water over the dry lath. He does this because he knows that dry lath will absorb too much of the water from the mortar to make a good job.

### Length of Rafters.

*From* F. C. C., *Chardon, Ohio.*—In the September number of *Carpentry and Building*, J. C. R. gives the length of rafter for a third-pitch roof on an 18-foot span, as 10 feet 9½ inches, which, according to the rule of square root, is too short. The method that I use for calculations of this kind, although not infallible, is nearer correct in its results than the figure given by your correspondent. It is as follows: Multiply the width of the building in feet and decimals of a foot by .6 (six-tenths). Example: Width of building, 18 feet; $18 \times .6 = 10.8 = 10$ feet 9.6 inches. This is about one-tenth of an inch short. This rule will be found to vary in this proportion on various widths of span.

### Addition to Two-Story Building.

*From* C. S. K., *Wakefield, Mass.*- I have a two-story pitch-roof building, 20 x 32 feet, with end and front entrance on the street. I propose to add an L, say about 12 x 16 feet. I would be pleased to have some of the readers of *Carpentry and Building* give me the best plan for dividing it so as to make it most convenient for two families. I intend there shall be folding doors between the parlor and sitting-rooms on both floors, and perhaps a slight projection on the side of the building to give width to the rooms back of the front entry.

*Note.*—If our correspondent, with his knowledge of the conditions involved, will make a plan according to his own ideas, making sure that the general dimensions are right, and will submit this for criticism and suggestion, no doubt some of the readers of *Carpentry and Building* will be pleased to help him.

### Strength of Joists.

*From* C. H. L., *Fitchburgh, Mass.*—I desire to say, in reply to C. R. S., that his pine joist will be weakened by cutting a 3-inch relish. There is no certain weight that will break it, as different sticks will stand different weights. A joist 2 x 15 inches with a 3-inch relish, will not stand as great a weight as a joist 2 x 12 inches without a relish.

### Radius of Segment.

*From* G. W. L., Jr., *Norwich, Conn.*—I will give a rule for finding the radius required for sweeping a segment of a circle, the chord and altitude of the segment being given. It is the most desirable one that I know of: Add the square of the altitude to the square of one-half the chord. Divide the sum by twice the altitude. The quotient will be the required radius.

### Segment Heads.

*From* R. R. T., *Sterling, Kan.*—From an experience gained in business since 1853, I believe that taking the width of the frame in the clear for the radius of the segment-head is the best rule for the purpose, and, therefore, I forward this in answer to the question proposed by T. B. in a recent issue of the paper. Were this rule generally adopted, it would save all risk from making special orders. Were it universally employed, the sash from all the factories would fit.

### Number of Nails to the Pound.

*From* G. S. A., *San Francisco.*—The following rule for getting the number of nails to the pound I have never seen in print: Divide 600 by the number of penny. For

example, what is the number of 8d. nails in a pound? 600 ÷ 8 = 75. For all sizes between 6d. and 60d. the rule works well.

### Designs from the Paper.

*From* AMES BROS., *Silverton, Oregon.*—We have built to several of the plans published in *Carpentry and Building*, making very slight alterations to suit individual requirements.

### Strains in Tie Rods.

*From* W. W. CARLIN, *Chautauqua, N. Y.*—I again beg leave to ask a question through the columns of your valuable paper, and that is for a proper method of computing the strain on what is sometimes called a "hog chain," when used to support a girder. The matter has been one of doubt and perplexity many times. I have always aimed to give such members of a truss a strength sufficient to overcome all fears of their giving way under any load they could ever receive, and so far have always been successful; but the falling of two such girders in a neighboring town (one while receiving the floor joist, and the other from its own weight) has started quite a discussion as to what is sufficient in such cases. The building referred to was intended for a factory, and was to receive heavy machinery, quantities of lumber, &c. I have not learned the length of the spar nor size of rod employed. Will write you when I ascertain the facts.

Would like to state the question like this: A girder having 24 feet between supports is required to support a load of 5000 pounds in the center. The available depth is 18 inches. What must be the size of a rod passing from the upper end corners under a strut or support in the center, the sag or drop of the rod being 16 inches?

According to the best authorities, if the girder in question could be supported in the center by a vertical rod—one of ½ inch square section would be sufficient to insure safety—how much larger must it be in the case above stated?

*Answer.*—In reply to our correspondent, and for the information of others who may also be interested in the subject, we give the desired solution of the above question in a general form.

Let Fig. 1 represent a trussed beam with single strut, the length A B between supports to be S, the depth of the strut *g f* measured from the center of the beam to the center of the tie-rod to be D, and the length of the tie-rod B *f* (per panel) to be represented by T, and the load at the center of the beam to be equal to W, then the strains in the different parts will be as follows, viz.:

Compression in strut $g\,f$ = ..... W

Compression in beam A B = ..... $\frac{W}{2} \times \frac{C}{D}$

Tension in the tie-rod A *f* B = ..... $\frac{W}{2} \times \frac{T}{D}$

which formulæ expressed in words give the following rules:

1. To find in a trussed girder, with single strut and loaded at the center, the compression in the beam, multiply one-half the load by one-half the span, and divide the product by the depth or length of the strut.

2. To find the tension in the tie-rod, multiply one-half the load by the length T of the tie-rod, and divide the product by the depth of the strut.

3. The compression in the strut is equal to the load W resting above it.

Applying these rules now to the question asked by our correspondent, and substituting the values given by him into our formulæ, we have:

Length of span = 24 feet.

Depth of strut = 16 inches = 1.33 feet.

Load at center = 5000 pounds; hence,

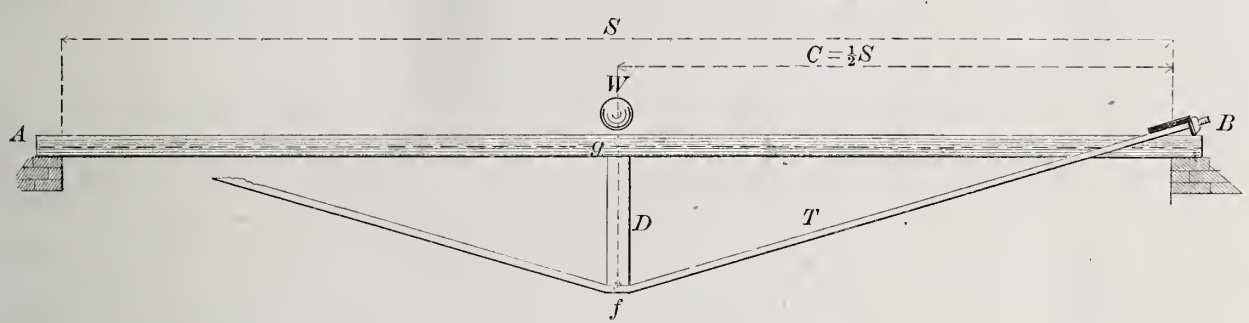
$$\frac{\text{One-half load} \times \text{one-half span}}{\text{Depth of strut}} = \frac{2500 \times 12}{1.33} = 22{,}556 \text{ pounds} =$$

compression in beam, and

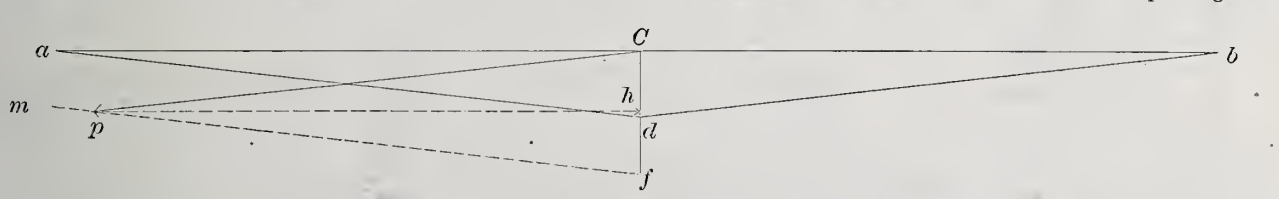
$$\frac{\text{One-half load} \times \text{length of tie-rod}}{\text{Depth of strut}} = \frac{2500 \times 12.07}{1.33} = 22{,}684 \text{ pounds} =$$

tension in tie-rod,

which, allowing a strain of 10,000 pounds per square inch for wrought iron, would require a round rod of 1¾-inch diameter. Another very simple way to get at the strains in such a beam is furnished by the graphic method. Draw the diagram of beam *a b c d* as below, in Fig. 2, to any convenient scale, say ¼ inch to the foot; then by any other scale, say 8000 pounds to the inch, lay off *c f* = 5000 pounds, representing the load upon the strut *c d*. Then draw *f m* parallel to *a d*, and from C the line *c p* parallel to *d b*; also draw a line *p h* perpendicular to *c f*. The lines *p h* and *p f* will represent the compression in the beam and the tension in the tie-rod respectively, to a scale of 8000 pounds to the inch. To those interested in the subject we recommend the series of articles entitled "Calculating Strains," published in the June, July, August and October issues of *Carpentry and Building*, for 1882, in which this subject was more fully treated.




*Strains in Tie Rods.—Fig. 1.—Trussed Beam with Single Strut Loaded at Center.*




*a b* = 24 ft.; *c d* = 1.33 ft.; *c f* = 5000 lbs.; *p h* = 22.500 lbs.; *p f* = 22.600 lbs.

*Strains in Tie Rods.—Fig. 2.—Graphic Method of Finding Strains in the Above Beam.*

## REFERRED TO OUR READERS.

### Paper Ceilings and Walls.

*From* J. & T., *Des Moines, Iowa.*—We would be glad to have the experience of readers of *Carpentry and Building* in the use of paper for the inside of dwellings, as a substitute for plaster, together with a description of their method of application, with particulars as to the quality employed and the expense. What we desire particularly to know is whether there is any article in the market made especially for this purpose and of sufficient strength to adapt it to this use. In the same connection we desire to know if any one can give us information concerning a paper shingle.

### Finish of Rafter Ends.

*From* H. C. S., *Mitchell's Mills, Pa.*—Will some practical reader of the paper inform me concerning rake finish, whether the ends of the rafters are cut off square or plumb with the building?

### Suggestions from a Reader.

*From* T. D. G., *Carson, Iowa.*—I would be obliged to you if some inducements were offered for designs of window and door frames, with inside finish made of pine, with lumber at a given price, &c. I should like to have some of the readers of *Carpentry and Building* tell the best way to fit butts when hanging doors. I should also like to have O. T. B., of Rockton, Ill., "scratch out" a few more ideas, and would be rejoiced if some of the readers would send in designs for bird-houses (martin boxes).

### Questions About Painting.

*From* G. H., *West Stockholm, N. Y.*—I think the painter's trade has not been considered as much as it deserves in *Carpentry and Building*. As backing hip rafters and constructing hopper bevels seem to lag, perhaps the best manner of painting may now receive a little attention. Occasionally a painter in the country is called upon to paint a weather-beaten building. Should the paint in that case be thick or thin for the priming coat? When is it advisable to use a coat of clear oil first? On an old painted building, where the paint is old and rough, is it best first to remove the old paint or to cover it? What constitutes a good paint brush, and how can it be selected? How is white paint to be applied on outside work so that it shall be smooth and not turn yellow with age? These questions are, to my mind, pertinent, and I think a discussion of them will be of general interest to your readers, even though they may not all be house painters.

### Cheap Construction for Double Tenements.

*From* C. S. K., *Wakefield, Mass.*—I think the subject of cheap houses would be of great interest to many of the readers of *Carpentry and Building*, especially information as to the cheapest way to build double tenement houses of light timber, well braced, to be plainly finished, and that will be warm and convenient.

### Stock for a Level.

*From* L. W. A., *Peterboro', N. H.*—I desire to ask of the practical readers of the paper, what will make the best level—one that will stay in place? Is it best to employ a solid

single piece of wood or two or more pieces glued together? What is the best kind of wood—cherry, rosewood, mahogany or black walnut? What would be the result of making the artile out of three pieces, using two of mahogany and one of rosewood, the rosewood being placed inside. Is such construction desirable?

### Horsing Up Stairs.

*From* J. S., *Riverton, Va.*—Tho articles on stairbu ding are very good, but a number of your subscribers would like to see more said upon horsing-up stairs, showing plans of construction, with all particulars that are necessary with relation to this work. Such descriptive articles are of the greatest value to practical mechanics, and if some of your correspondents will take up this question they will undoubtedly confer benefits on others besides the writer.

### Miter Between a Raking and Level Molding of the Same Dimensions.

*From* A. M. F., *Tilden, Tex.*—I am building a house in which a 4-inch molding is required to be run down the rafter to miter with a level molding along the eaves of the same dimensions. I am unable to cut the miter joint required to unite these two moldings. Will some of he practical readers of *Carpentry and Building* give a rule for work of this character? I thiuk it would be of interest to your readers generally to have the principles fully explained.

### Construction of Window Stools.

*From* B. J. P., *Willimantic, Conn.*—I desire to inquire for plans for carrying the drip water from window stools. The casement or sash set on each other, and the dropping of the water rots the stool. We have tried several ways, but none are satisfactory as yet.

### Plaster Board.

*From* C. S. K., *Wakefield, Mass.*—Have any of the readers of *Carpentry and Building* had any experience with paper plaster board made by the Rock River Paper Company and other makers, as a substitute for plaster? Is it all that the makers claim for it? What are its bad qualities, if any? It has never been used in this neighborhood, and I know concerning it only what the manufacturers' circulars state, and from examination of samples I can see no reason why it would not answer as well as plaster.

## Lettering for Drawings.

We have received from Mr. William A. Lorenz, 55 Garden street, Hartford, Conn., a card entitled "Lettering for Draftsmen." It contains an italic alphabet, both capitals and small letters, and a double set of Roman figures, one of the commou form and one called the "inclined antique." These letters are drawn on cross-section blocks in such a manner as to indicate to the novice in a very easy manner the relative proportions of the letters, as well as the best method of shading. The cards are sent by mail, postpaid, for 30 cents a copy. While iu any system of lettering it is essential to depend upon the eye almost entirely for the proportioning and curves of an alphabet, the beginner finds it exceedingly difficult to ascertain any approximate rule for his proportions, and consequently sometimes labors for years in a blind endeavor to make his lettering look right. The rules on the back of this card, together with the cross-section lines on which the letters are drawn, will afford the beginner just such a guide as is most necessary, and will be a very valuable aid in acquiring a correct eye for lettering. If the beginner has time to take a large alphabet of the common Roman characters, such as can be found in most of our type-founders' specimen books, rule it off with fine cross-section lines, and then copy it until he is master of it, he will find it the very best possible drill in lettering, aud will also find that no lp habet, however complex, will then present very considerable difficulties. Failing in this, which is beyond the reach of a large proportion of the practical workmen in the drawing office, the next best thing is such an alphabet as the one which Mr. Lorenz presents, because it gives in the simplest manner what is wanted, without the necessity for hard study that the ordiuary Roman demauds. The inclined antique figures which he gives are very good, and, slightly modified, might be used to advantage in the dimension-work upon a drawing. In such work we would suggest the use of a broad-pointed pen, and the abandonment of any shade lines. We would also for dimension lines prefer to have the figures stand erect instead of at an angle of 75 degrees, which, as Mr. Lorenz says, is best for title lines. If figures are placed erect, and carefully drawn with a uniform line of thickness throughout, they will be little liable to be mistaken, and the very angular and somewhat stiff character which is thus given, aids materially not only in recognizing the figure, but in compelling the draftsman to be careful in this very important part of the work. Mr. Lorenz has so arranged these figures, modifying the 9, that there is no danger of mistaking one for any other, even when seen upside down. He makes his figures two-thirds as wide as they are high, which is undoubtedly very good proportiou. For dimension-work the clearest, and, we think, the most rapidly-made, figure is one which is as wide as it is high, the rule applying, of course, to all except the uuit. We should in every case advise the drawing of the fractions somewhat larger than the figures themselves. That is, each of the figures iu the fraction ought to be rather more than half the hight of the ordinary figure. Figuring and lettering beiug usually the weak part of drawings otherwise correct and handsome, this subject deserves much more attention than it usually receives, for when neglected the best drawing has a most slovenly appearance.

## STRAY CHIPS.

At Monmouth, Ill., the Catholics propose to erect a new church building that will cost in the neighborhood of $10,000

A schoolhouse is being put up at Pembina, Minn., that is estimated to cost $10,000. The building will be brick, veneered.

Mr. A. D. Farmer is about erecting a four-story private residence in Pierrepont street, at the head of Monroe Place, Brooklyn, N. Y. The cost of the building is estimated at $70,000.

Mr. Whitten Burnett, of Boston, Mass., is the owner of an immense building block that is being erected at Fargo, Dakota Territory. The estimated cost of the structure is $200,000.

Mr. Alexander Ramsey is putting up a building at St. Paul, Minn., that will be used for stores. The structure is of brick, 50 x 100 feet in size, and three stories in hight. The cost is $18,000.

Breckenridge, Minn., has finished a two-story brick schoolhouse, costing $10,000, and has now in progress of construction a court house that will cost $40,000. It is expected to have it completed early in the spring.

On the Eastern Boulevard, at Seventy-first street, New York City, Mr. Edward Leissner proposes to put up a factory building that will be seven stories in hight. It is estimated that the structure will cost in the neighborhood of $70,000.

Mr. Edwin B. Sheldon, of Chicago, Ill., is about putting up, on Huron street, between Dearborn avenue and State street, a four-story apartment house. The structure will have a frontage of 29 feet and a depth of 90 feet. The estimated cost is $20,000.

Messrs Price & Freeman, of New York City, have prepared designs for a house to be erected at Englewood, N. J., to cost $60,000. The first story of the building will be of stone, while tile will be employed in the upper stories and in the roof.

Work on the foundations of the First National Bank building, at St Paul, Minn., has been steadily going on, and they are now reported up to grade. The structure will be 50 x 100 feet in size, and cost $80,000. Mr. D. W. Millard is the architect.

The North Side Turners, of Milwaukee, Wis., laid the corner-stone of their new Turn Hall, corner of Third street and Reservoir avenue, on Thanksgiving Day. The new building will be of brick, 50 x 130 feet in size, and three stories in hight. The cost is estimated at $12,000.

Mr. Minot, the engineer of the Boston and Providence Railroad, is perfecting plans for a union depot at Providence, R. I., that will be occupied by the Boston and Providence, Providence and Worcester, Providence and Stonington, and New York and New England railroad companies.

Mr. H. Babcock, of Neenah, Wis., is building a fine residence, which is estimated to cost, when completed, about $25 000. The structure will be of Racine brick, and will be furnished throughout with gas and water, and will be heated by steam. Mr. D. W. Barnes has the contract for the mason work.

The Madison Plow Company are putting up extensive buildings at Madison, Wis., for manufacturing purposes. The machine shop is 50 x 150 feet in size, the foundry 50 x 100 feet, the blacksmith shop 70 x 30 feet, the paint shop 40 x 100 feet, setting-up room, 35 x 160 feet, and the wood shop 50 x 180 feet.

Work on the Insane Asylum at Meridian, Miss., the plans of which were prepared in the spring of last year by Mr. A. J. R. E. Zucker, has been progressing finely. The structure, when completed, will be 340 feet in length, 96 feet wide and four stories in hight; 3,500,000 brick will be required for the building.

Mr. Wm Buchtel proposes to erect at the southeast corner of Mill and Main streets, in Akron, Ohio, an extensive hotel building. It will have a frontage on Mill street of 60 feet and on Main street of 112 feet, and will be six stories in hight. It will be known as the "Grand Hotel." The cost is estimated at about $75,000.

New Philadelphia, Ohio, has been and is still making some improvements in the way of new buildings. Mr. F. T. Shrake, of that place, has just completed a new flouring mill for Marshall Wheeling, costing about $11,000. The Moravian Society have in progress of erection a church that will cost in the neighborhood of $4500, and Mr. Fred. Eckert has put up a dwelling-house at a cost of $2000.

The property of the late A. T. Stewart, situated at the corner of Broadway and Reade street, New York, has been for the past few months undergoing some important interior changes. The improvements proposed are the erection of four new buildings and raising the present structure two stories. The material for the improvements will be marble, and will be supplied by the quarries at Tuckahoe, Westchester County, N. Y.

A new building for St. Joseph's Institute for the Deaf and Dumb is to be erected near the site of their present building in Westchester, New York. The structure will be 100 x 50 feet in size, with an extension 20 x 11 feet. The material used in the construction will be brick, with trimmings of bluestone. It will be five stories high, and the estimated cost is $36,000. Messrs. Babcock & McAvoy, of New York City, were the architects who prepared the plans.

The amount of building that has been going on in Anthony, R. I., during the past year has not been surpassed by that of any previous year for a long time. A number of dwellings have been erected, and additions and alterations have been made in various places. Prominent among the work that has recently been completed is a large structure which is used as a furniture and undertaking establishment. The building is 100 x 40 feet in dimensions, two stories high, with French roof and basement. The floor space is about 16,000 feet. The owner is Mr. Byron Read.

The Manhattan Storage Company are erecting a rather curious-looking structure at the corner of Lexington avenue and Forty-second street, New York City. The building has a frontage on Lexington avenue of 200 feet, and will be eight stories in hight. It is designed to be fire-proof, the materials used being iron, brick and cement. It is stated that there will not be a square foot of wood employed in the entire building. A novel feature of the structure will be a driveway running through the middle from Forty-first street to Forty-second street. Each floor will have a number of apartments, separated by thick walls. The floors will be of cement throughout. The cost is estimated at $500,000.

The building operations that are going on in New York City at this season are confined, to a considerable extent, to remodeling and making additions to old structures. Plans, however, have been filed in the Bureau of Buildings for a number of apartment houses, office buildings and warehouses, scattered through the length and breadth of the city, but the number of immense structures similar in size and character to those that formed such a prominent feature of the building enterprises during the year and a half just past is very limited. In the upper part of the city, above 100th street, numerous private residences are being put up, and in a few years it is not at all improbable that New Yorkers desiring fine residences will have to go far up above the Harlem to find a desirable site. The indications for the immediate future, judging irom the present outlook, are that carpenters and builders will be busy for a time at least.

The new Physical and Chemical Laboratory of Cornell University, at Ithica, N. Y., is rapidly nearing completion, and it is expected that the building will be ready for occupancy early the coming spring. The structure is about 160 feet in length by 60 feet in depth, and is four stories in hight. It is built of red Medina sandstone, with trimmings of cream-colored Ohio stone, and with columns of polished granite at its entrances. A peculiar feature of its adornment is the insertion in the walls of large medallion portraits, in terra cotta, of the most eminent modern chemists and physicists. The edifice contains lecture-rooms, laboratories and rooms for collections, besides accommodations for all the special processes demanded by the most advanced study of the two sciences to which the building is devoted. An interesting feature in connection with the laboratories is a special workshop for the manufacture and repair of physical apparatus. This shop has been fitted up at great cost with the best of machinery, the latter being run by means of a turbine. The structure is heated by steam and ventilated by means of air driven through steam coils by revolving fans. The architect of the laboratory is Prof. Charles Babcock, who holds the chair of Architecture at the University. The builders are Messrs. Richardson & Campbell. The entire cost of the building, with its apparatus, is estimated at something over $100,000. The structure is undoubtedly one of the most expensive and best equipped for the purpose for which it is intended in this country.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=FEBRUARY, 1883. NUMBER 2.

### Modern Stained Glass.

An irreverent critic discusses Mr. La Farge's recent work in stained glass, as follows:

Mr. John La Farge has just completed three stained-glass windows designed for the house of Mr. Ames, of Boston. These windows were on exhibition yesterday at Mr. La Farge's rooms, and their exhibition was the occasion of throwing several worthy-minded visitors into a state of great confusion and perplexity. It was embarrassing for the one who ecstatically admired "those hollyhocks against a wall" to be told in a horrified manner that the "wall" was no wall, but "a far-reaching perspective." It was extremely unsettling for another to be refused permission to label the two larger windows with the safely vague titles of "symphonies in blue," especially since their blues belonged to nothing in the heavens or on the earth or under the earth. And even the Philistines agreed to disagree, for one traced the outline of a turbaned Turk in the corner of the window on the right, while another strenuously insisted upon recognizing the figure of jovial hook-nosed Punch.

The composition of the two larger windows easily lent itself to extraordinary imaginings. There was a dazzling peacock in each, with a gorgeously iridescent tail that swept across the window like a glorified comet. There were huge flowers emulating the peacocks in size, and suspended above them like the sword of Damocles. In one window a brook was evidently depicted, while in both the backgrounds were of a deep and serious blue. The flowers, peacocks and blues formed the bodies of these two windows. Below were somewhat conventional arrangements of opalescent glass framed in lines of glass jewels, for the most part milky or slightly iridescent in their coloring, while above were semi-circles of more brilliant jewels, in which shone the hues of the ruby, sapphire, turquoise and emerald. The effect was dazzling and somewhat bewildering. Mr. La Farge, by his avoidance of painted glass, and by mixing his pigments with the glass in a state of flux; by casting some single bits, like these flowers, in a mold; by plating one piece of glass upon another, by the intaglio method—if it may

*Fig. 1.—South Elevation.—Scale, ⅛ Inch to the Foot.* *(See next page).*

A STUDY IN SUBURBAN ARCHITECTURE.

be so called—which prevails in his windows, and by his liberal use of glass jewels, produces strong and in their way remarkable effects of coloring. His work fairly suggests the question as to what the true artistic sphere of the stained-glass window is, and it is not hard to find objections to this complicated building up of glass pictures. If the primary object of any window, stained glass or not, is to admit some light, Mr. La Farge's windows would be found wanting. The fantastic composition in the two larger windows betrays a fussiness and striving for effect which are disturbing and unpleasant. The smaller window, yet unframed, is simple, and from the very simplicity of its design—a stalk of hollyhocks—gains a richness which is lacking in its more pretentious neighbors.

The fall of a very lofty chimney a few weeks ago in an English manufacturing town, from no apparent cause, has led to a number of investigations in regard to the durability of chimneys and causes which may lead to their decay. In New York City house chimneys and brick walls exposed toward the south or southeast with time invariably begin to assume a convex form, and generally, if the chimney be lofty, will lean toward the north, the southern wall pushing the chimney over bodily. This action apparently comes from a thickening of the mortar on the southern side. The action is observable in fire walls only 3 or 4 feet high above the roof, and in chimneys of all hights. The number of years for the change to be perceptible we do not know, but have noticed it in walls, which, judging from surrounding circumstances, were not more than 10 or 15 years old. It is possible that to this action the destruction of the English chimney may be traceable.

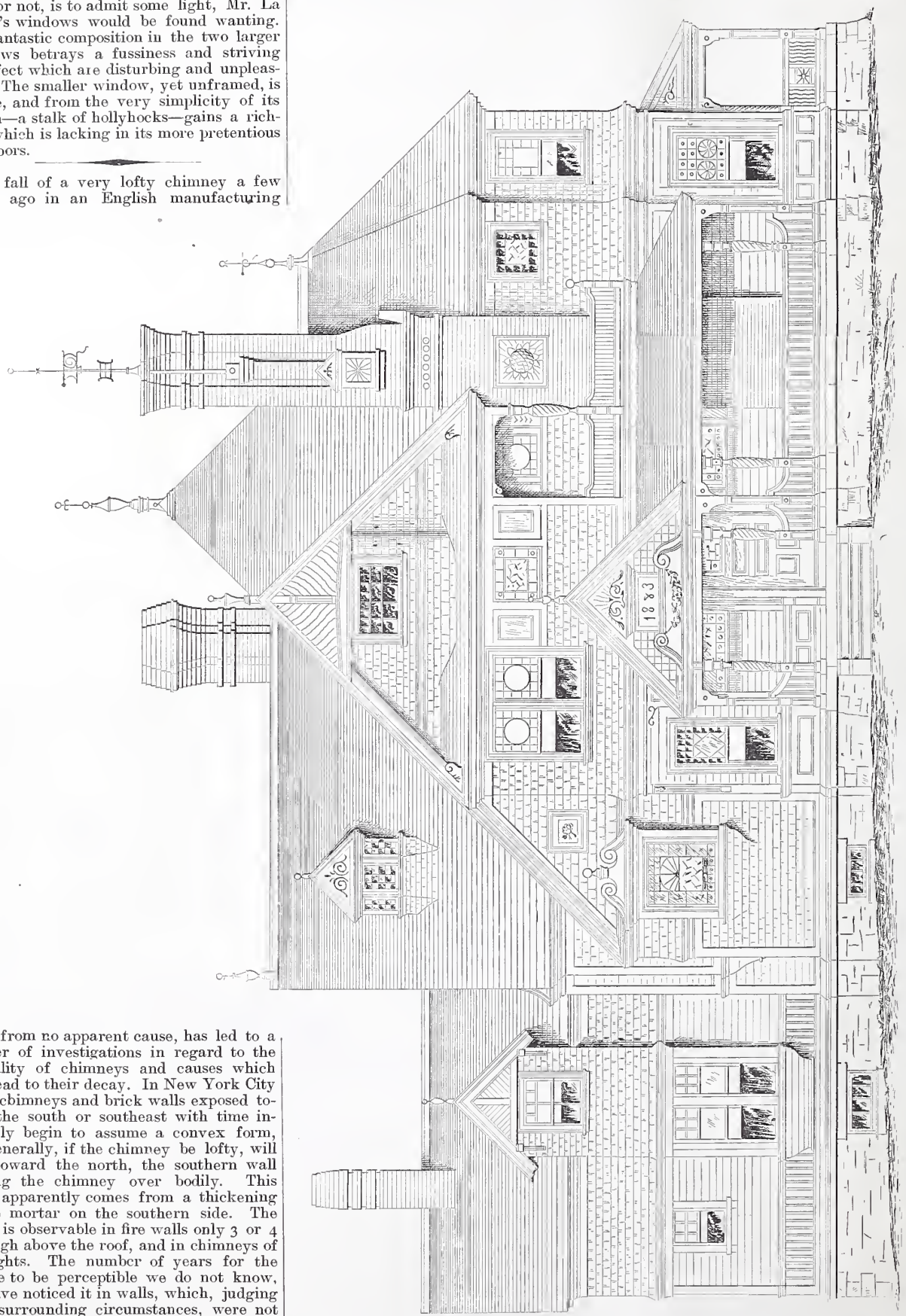
At the late fair of the American Institute, a medal was awarded to the Wells Mfg. Co., of Ashaway, R. I., for superiority in boring machines. These machines are well finished, and the working of the automatic mechanism is satisfactory.

## A Study in Suburban Architecture.*

BY AN ARCHITECT.

### Elevations and Grounds.

While designing the elevations we have had constantly in mind the old houses before mentioned which adorn our street. We have examined the details of these old houses, and find them a pleasing study. We have no desire to make a literal copy of any of them, but have tried to incorporate some of their charming details in an elevation which, as a whole, is entirely different from these old examples. The house is to be a frame structure, resting on an underpinning of natural face stone of uneven colors, varying somewhat like the darker shades of autumn leaves. This stone is to be laid in random courses and jointed with a dark-red raised joint. The greater part of the first story will be clapboarded. The belt course, which indicates the level of the second floor, will be heavily molded, with perhaps a dentil course. The second story will be covered with cedar shingles, which will be laid in irregular courses, stained and oiled. It is our intention to shingle the roof and perhaps paint it. The chimneys are to be built of best quality pressed brick, laid in dark-red mortar. The caps are to be of brown sandstone, and the ornaments in the face of the chimney dark-red terra cotta.




*A Study in Suburban Architecture.—Fig. 2—Front Elevation.—Scale, ⅛ Inch to the Foot.*

* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.

The cellar has been arranged so that a well-lighted laundry is obtained. An outside entrance to the cellar is so placed as to approach the different rooms without passing through other rooms. With reference to heating, space has been reserved for double boilers, one of which can be run in the fall and in mild winter weather, and both during the more severe months. It is intended to heat by indirect radiation, and cold-air boxes are provided in the same manner as those for an ordinary furnace. The foundation walls are to be 20 inches thick, and the partition wall 8 inches thick, all laid in mortar.

Considerable attention has been given to the position of the house on the lot. Advantage has been taken of the fall of Station street toward the east to enter the stable-yard at the lowest level, and this, with the help of the lattice extending along on top of the bank wall, will entirely hide this yard from the view to be had from the lower story windows. Through the stable-yard it is intended that the help shall approach the house, and by the flight of steps at the southwest corner of the stable they can ascend to the level of the lawn.

The lattice, extending from the stable to house, will serve as a screen to the clothes-yard as well as a support to grape vines. Water has just been introduced in our village, and the pipes are laid in Thoroughfare street. Sewers are not provided yet, but a private sewer has been run through Station street to the river. This we shall enter, as shown on the plan of lot. It is our intention to curb the lot on Thoroughfare street with a granite curb about 12 inches high, and after turning the corner, extend the same as a capping to a natural face stone wall, running level to the east as far as the summer-house, at which point it will be about 7 feet high, owing to the fall of Station street. The summer-house will not only form a pleasing corner, but will have a good outlook above the street.

*A Study in Suburban Architecture.—Fig. 3.—North or Rear Elevation.—Scale, ⅛ Inch to the Foot.*

## Pedantic Architects.

Under this title, a writer in one of the daily papers presents the following arraignment of the architects in this country:

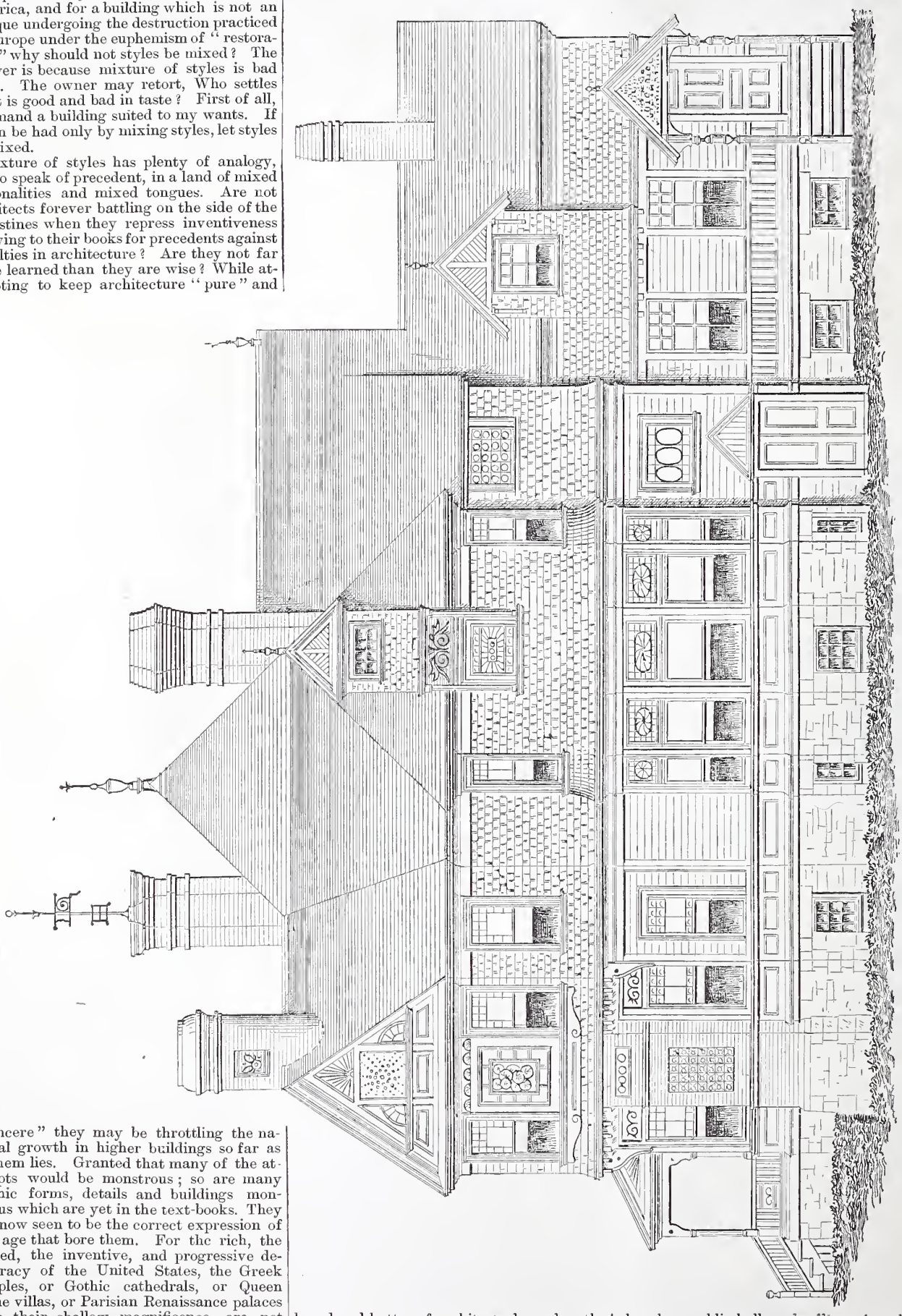
When the Institute of American Architects was founded, in 1857, it was, by some, supposed that a new era in American architecture was about to begin. On its reorganization, in 1866, it was hoped that much more than practical reforms, like an equalization of architects' fees, would be brought about. The movement was thought excellent merely as a business matter for the architects themselves, and because it seemed to afford some measure of protection from adventurers calling themselves architects, but wanting education and honesty. It is quite possible that some such good has come of the Institute. But the enthusiasts hoped better. They thought the stated meetings of architects would widen and educate members through interchange of ideas, and that, directly or indirectly, the standards of the profession throughout the country would be raised, while, as a further gain, there would be a great advance in all methods having for a final result the development of an original, characteristic and national style.

So far, however, the event is anything but that. Our architects meet in convention and issue languidly enough a periodical, elect new members, and listen to essays and lectures. But we do not find good architecture in sufficient quantity to warrant the belief that of the higher good expected to flow from the Institute there has been any measurable amount. On the contrary, the Institute is only too apt to place the weight of its authority in the scale of conventionalism, moneyed timidity, imitation of hackneyed European work, Philistinism. There is no profession that can be embraced in the term fine arts, which is so bound to material interests, so at the mercy of the newly enriched and of persons who owe success largely to their inability to appreciate the fine arts, as architecture. To gain his own way the architect has to fight with desperation, or his nicely adjusted plan will be swamped by the untrained ideas of vestryman or millionaire. But poor work is not always the fault of the moneyed person or committee. It is too often the fault of the architect, or, more remotely, of his education and the present state of his profession. In most cases the architect simply tries to keep the building consistent with the "style" which has been chosen. All the styles are in the books. It requires little reading to arrange details. What bothers him is the suggestion of the mere business man, who would supply a Romanesque church with a Gothic porch, or a Queen Anne façade with a Greek pediment. Now, it sounds reasonable enough when the architect invokes the testimony of authorities in behalf of purity of style. Laymen are abashed when shown that separate styles have appropriate details, and that sincerity, historical unity, and several other imposing terms demand that a style must be followed out consistently. Writers at large aid in the

work by bewailing such mixture of styles as we already show. But are they not on the wrong track? Is it the mixture that is bad? Rather the badness of the mixture. Are we not surrendering freedom of choice on very shallow grounds—on the word of trained, but pedantically trained, architects? In America, and for a building which is not an antique undergoing the destruction practiced in Europe under the euphemism of "restoration," why should not styles be mixed? The answer is because mixture of styles is bad taste. The owner may retort, Who settles what is good and bad in taste? First of all, I demand a building suited to my wants. If it can be had only by mixing styles, let styles be mixed.

Mixture of styles has plenty of analogy, not to speak of precedent, in a land of mixed nationalities and mixed tongues. Are not architects forever battling on the side of the Philistines when they repress inventiveness by flying to their books for precedents against novelties in architecture? Are they not far more learned than they are wise? While attempting to keep architecture "pure" and "sincere" they may be throttling the national growth in higher buildings so far as in them lies. Granted that many of the attempts would be monstrous; so are many Gothic forms, details and buildings monstrous which are yet in the text-books. They are now seen to be the correct expression of the age that bore them. For the rich, the varied, the inventive, and progressive democracy of the United States, the Greek temples, or Gothic cathedrals, or Queen Anne villas, or Parisian Renaissance palaces with their shallow magnificence, are not suitable. If parts and portions of any or all are fit, let them be taken. The crusade against eclecticism is one of the most absurd, because the crusaders are themselves the first to pick, choose and adapt their finds.

American architects are too apt to take *au serieux* the excellent advice of European masters and pedagogues to pupils, even as American painters will still do, forgetting that schools are places for discipline, and not for research or evolution of original ideas; forgetting that the artist who does not outlive and out-think his pedagogues will never rise to anything much higher. It is true that generally the bread and butter of architects depend on the ability to show clients that the plan they offer has European precedents. It is a fact that there is for them every discouragement from original, and slow, and matured research into the higher imaginative walks of architecture. But in this, as in every profession, there are young men who have formed an ideal of what the profession should be, and who look on with disgust when they observe their elders quietly surrendering their principles in art for material success. American architecture as a national creation must look to them. As our great cities grow larger and larger, new forms spring up—here a railway station, there a theater, a church, a public hall, a dwelling—in which the changing needs of modern life have required new principles and have got them. Out of all these gropings, in spite of crudeness and a thousand mistakes, must come the new architecture. It is the young men of the profession, willing to make sacrifices for their magnificent art, who must hasten the development.



*A Study in Suburban Architecture.—Fig. 4.—East Elevation.—Scale, ⅛ Inch to the Foot.*

## Rich Men's Houses.

This is an age of great fortunes. Never before in the history of the Republic have there been so many men who are very rich. Of course, this term has a purely relative value. One who might have been "very rich" in 1842 would not be accounted rich at all with the same fortune in 1882. But the number of men who are worth, say, ten millions or more is far greater now than ever before since the foundation of the American Republic. These fortunes have been made in various ways. Here in New York our richest men are or have been nearly all speculators in railway securities. There are three or four estates, the property of old New York families, held together by a family understanding or by an unwritten law of primogeniture. These properties are the accumulation of many years of honest dealing in real estate. They represent the enormous profits derived from early and permanent investment in city and suburban lots. Estates of this kind are held by heirs of famous names, very much as if the holders were owners of stock in a corporation. The stockholders, however, are heirs-at-law. Nobody but the family lawyer knows what interest each individual has in the vast undivided estate.

Rich men of this class look down with indescribable disdain upon the other rich men who have amassed money by speculating in stocks, mines and railroads. The returned Californian who brings to New York the honest spoil of many a panic in mining stocks—gild him with gold an inch thick—is regarded as still semi-barbaric. No bonanza prince, although he roll in riches and wear diamond headlights on his shirt-front, can ever hope to be anything more than a lucky accident—a kind of social curiosity. And he who has sailed into the port of prosperity by trimming his sails to catch sudden breezes from Wall street may bless his lucky stars that he is safely moored at last; but he is told in innumerable ways that he is a parvenu, and his wife might as well have been a chambermaid as to have linked her fortunes with his. It is in vain that the richest Crœsus of the railway millionaires boasts his vast wealth, jingles his ponderous watch-seals, and swears that he can buy and sell the landed aristocrats who turn up their noses at him. A parvenu he is and a parvenu he will remain unto the end of his days. He is carefully looked over by people whom he despises for their poverty, and is dismissed with the dreadful phrase, "no gentleman."

Something must be done by the vulgar millionaire to assert himself. The standing of a man, in this realistic age, is thought to be best assured by his building a great house. In England, where laws of primogeniture and entail are in force, a great family house is possible, even desirable. The names of many famous family seats, hoary with antiquity and rich with the historic and artistic spoil of ages, will occur to the reader. These are houses of the great, and they often continue in possession of families for centuries, and long after the ability to maintain and increase their splendor has departed from degenerate or unfortunate descendants. But nothing of the kind is possible in this Republic. We have no ancestral families. The children of a ferryman, inheriting great riches, may leave to their children nothing but the privilege of taking to the humble calling that their illustrious ancestor adopted as the introduction to his subsequent prosperity. The æsthetic Crœsus who tossed pancakes, sold whisky, gum-boots and mines in his early years in California, can leave no possible assurance behind him that his heirs, born into the purple of new riches, may not ultimately gravitate backward into the humble walk with which his feet were once so familiar. Whose, then, will be the palaces that he has builded?

But the houses of the great are built for present uses. While people of small incomes groan over the difficulty of keeping up de-

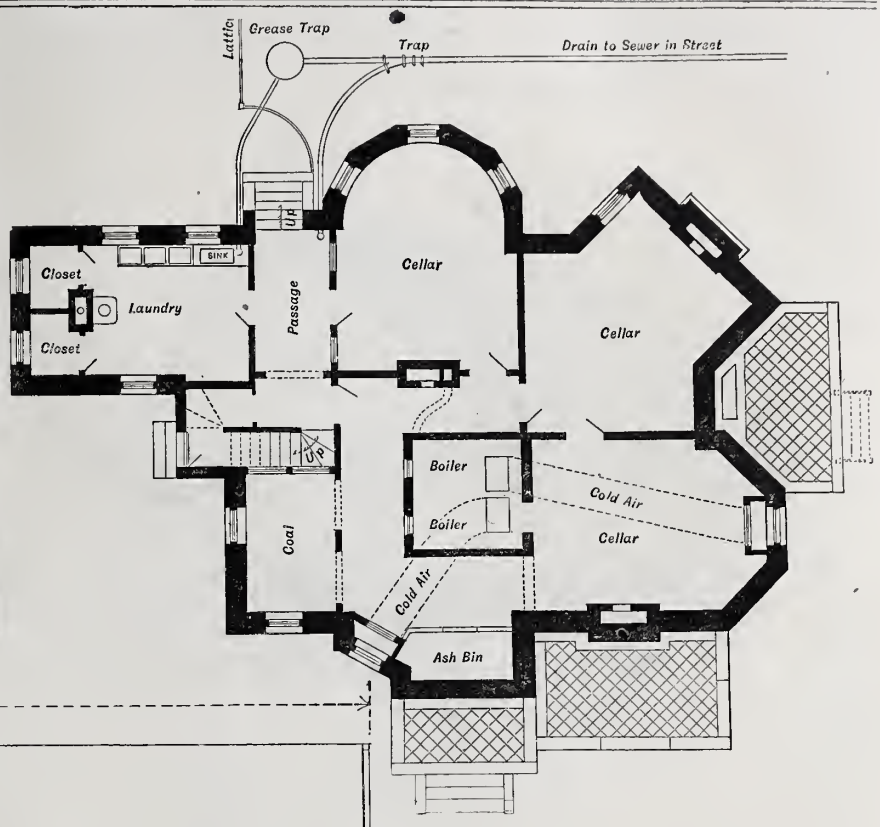
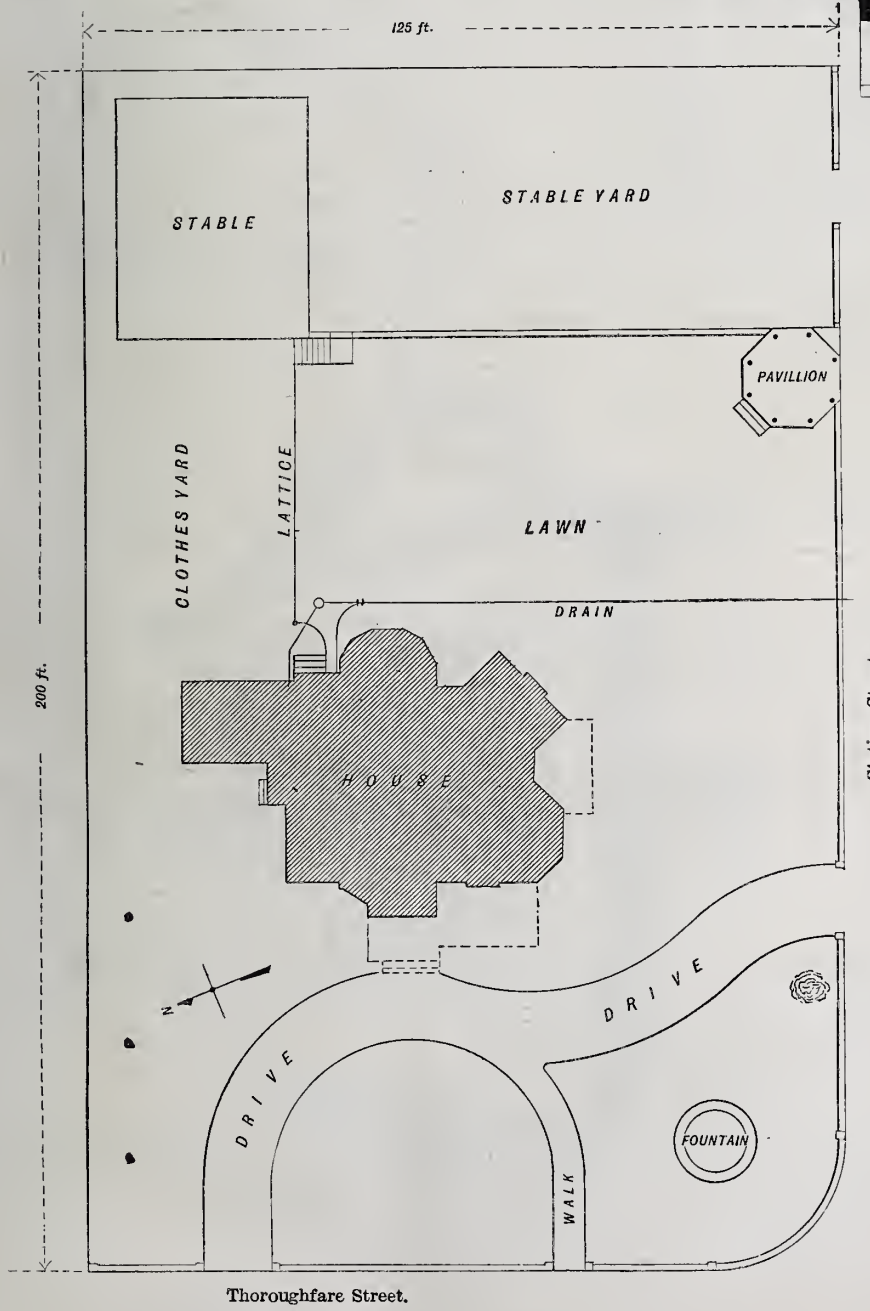


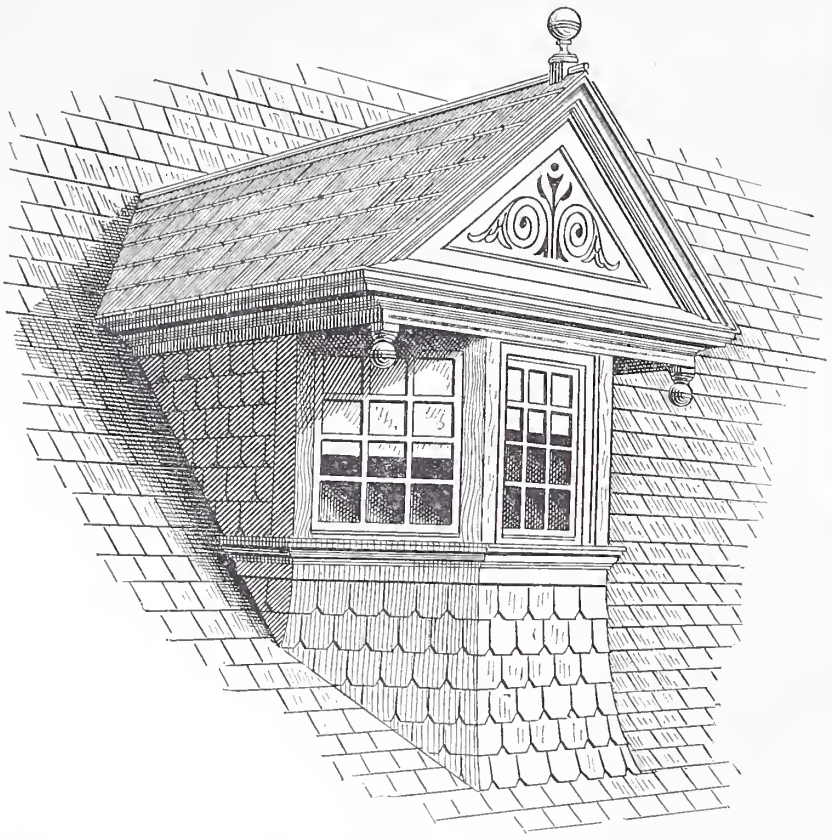

*Fig. 6.—Cellar Plan.—Scale, 1-16 Inch to the Foot.*




*A Study in Suburban Architecture.—Fig. 5.—Plot of Grounds.—Scale, 1-32 Inch to the Foot.*

cent appearances in hired houses, the very rich exhaust the resources of nature and art in attempts to produce more splendid palaces than any ever built before. Dealers who have costly luxuries to sell are overwhelmed with orders. The rarest, finest and most unique articles of household and personal adornment are sought for with eager lavishness. Those who deal in staple goods adapted for the common uses of the middle classes complain that the times are dull. This is not a wholesome sign. But the rich build for present purposes. They say, in effect, "After us the deluge." Is it certain that when Crœsus is done with his gorgeous palace, and shall take up his abode in that "narrower house, a house of clay," that awaits each man of us, there will be other rich men who will be willing and able to inhabit the mansion he must leave behind him? It may be taken for granted that the rich man's children, who begin where their father leaves off, will not require his baronial residence. And when the suddenly acquired riches of the mushroom family are dispersed again, who shall occupy these beautiful mansions?

No matter; these palaces are the monuments of ostentatious wealth. They serve their purpose, no matter how ugly, incongruous and inartistic they may be, if they only cost much money. So we are told of a $10,000 chimney-piece, a $35,000 bronze railing, a stained-glass window that cost $60,000, and a house that has $200,000 worth of upholstery and decorative art in it. The cost of these things is the monument of the great man. Into the midst of these æsthetic splendors he comes with the memories of his humble, perhaps squalid, home thick upon him. He remembers, with a secret dread of being found out, the unfragrant shop where he sold rum and red herrings in a long-buried past. He cannot help contrasting the gilded luxury and Oriental gorgeousness of his new house with the vulgar poverty of his cabin in the mines, or his father's farmhouse in the forests. He lives in the purple, but he was born in tow. He measures his social standing by the vastness of his expenditures. This house, with its treasures, is all his. His money has paid for all. There is no sheriff, no creditor, waiting for him at the door. But, after all, what will he do with it? He has built him a house, but not a home. His palace is full of things that he does not understand. He is uneasy in the midst of unaccustomed splendors. And when he is done with it the neighbors will idly ask, "Who will have that fine house next?"



*A Study in Suburban Architecture.—Fig. 7.—Perspective View of Dormer Shown on Front Elevation.*

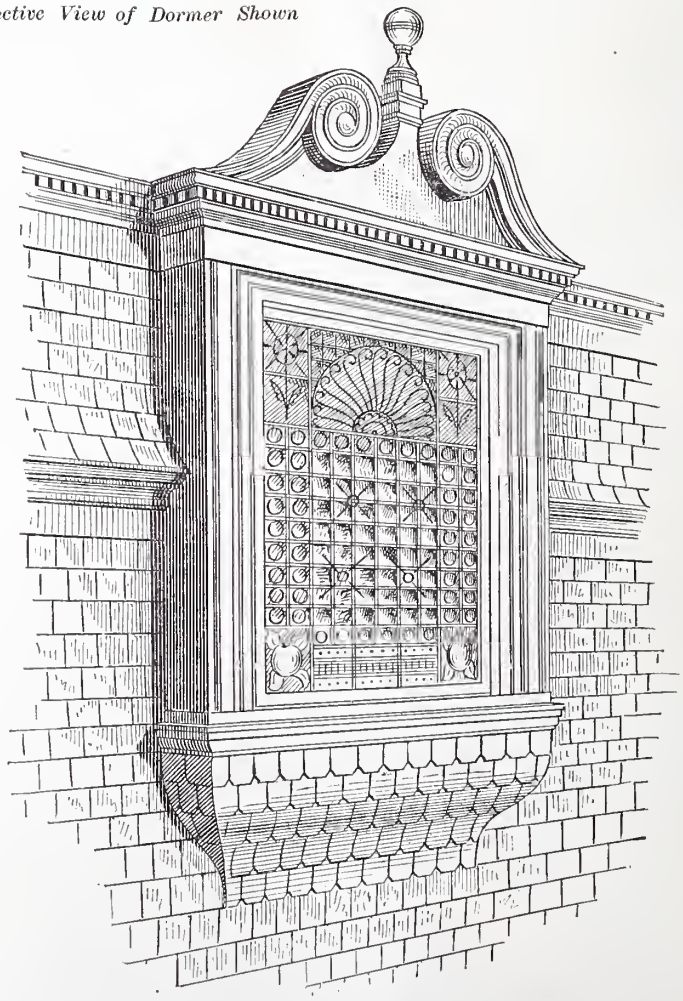


*Fig. 8.—Window Lighting Staircase. (See Front Elevation.)*

The value of the building improvements at Fergus Falls, Minn., during the past year, are said to amount to $742,271.

## Straightening a Chimney.

An interesting account of straightening a chimney 330 feet high is given in one of our foreign exchanges. The chimney in question, erected in 1880–81 for the blende-roasting furnace of the Liebehoffnung Zinc Works, at Antonienhütte, Silesia, for carrying off sulphurous gases, soon after its completion began to curve in consequence of strong and continuous gales from the southeast. The work of straightening it was at once confided to two experienced chimney-builders, Herren H. Hohmann and F. Ebeling, of Bernburg. It should be here stated that the chimney was begun in July, 1880, the base, 53 feet high and 24 feet square, being finished before the setting-in of winter, when operations had to be suspended. The work was resumed in the following spring, and actively pushed forward, so that by the end of September, 1881, the chimney was completed. I s principal dimensions in feet are:

| | | | Hight. |
|---|---|---|---|
| Base, 24 feet square | | | 53 |
| Octagonal portion | | | 10 |
| Round shaft | Diameter at base | Exterior, 19 ft. | 267 |
| | | Interior, 5 ft. 6 in. | |
| | Diameter at top | Exterior, 9 ft. | |
| | | Interior, 6 ft. 6 in. | |
| Total hight above ground | | | 330 |

The base is of ordinary Dutch brick laid in lime mortar; the round shaft, 267 feet high, of stone and lime mortar, to which was added cement in the upper portion of the chimney, from 40 feet below the summit. The thickness of the walls of the round shaft, constructed in 13 steps, each about 20 feet high, is at the lower portion 6 feet 6 inches; at the top, 1 foot 3 inches.

The completed chimney was first used in October, 1881. Soon after it began to show a strong curvature toward the northwest, beginning at the foot of the round shaft and running up toward the top in the form approaching a parabola. The curvature was ascribed, as stated, to the continuous southeast gales prevailing at the time, to which the brickwork, which was not yet sufficiently set, had to give. As the foundation of the chimney went down to the solid rock, its

curvature could not be attributed to the giving way of the foundation. Subsequent measurements proved, moreover, that the square base had not moved out of the perpendicular, but had remained undisturbed. It was determined by measurements that the summit of the chimney had gradually bent over nearly 10 feet toward the northwest, so that a plumb-line suspended from the center of the periphery of the inclined chimney-top was hanging outside the base of the chimney. The two builders named above undertook to remedy this dangerous state of matters, and began work on July 1. The chimney was first mounted by means of their special scaffolding to a hight of 139 feet, where the first cutting was to be made. At this portion the outer diameter of the chimney is 16 feet, the inner 6 feet 6 inches; the thickness of the wall was consequently 4 feet 9 inches. The weight of the portion of the chimney-shaft above this first cutting, of a hight of 191 feet, is about 670 tons. Calculations and measurements with zinc gauges had shown that a perpendicular from the calculated center of gravity of the portion of the chimney above the cutting, to a hight of 191 feet upon the section plane, intersected the latter about 3.29 inches inside the periphery of the width in the clear of 6 feet 6 inches diameter, at a distance of about 5 feet from the outer edge of the brickwork.

For safety's sake, and because the mortar had not sufficiently set, owing to the chimney being taken in use directly after completion, six strong wrought-iron rings, with spring locks, were placed round the chimney above and below the cutting. The latter was begun while the roasting furnace was continued at full work, and had proceeded so far by July 21st that the projection of the center of gravity upon the section had been undercut to the extent of 3¼ inches. On one side, however, a piece of the brickwork had remained, and could not be cut away by the saw, because the latter began already to get too much jammed in the cutting. This piece of brickwork prevented the upper part of the chimney going back, as it hindered the intended turning at the end of the cutting. The consequence was that, the other side of the chimney being undercut, the upper part turned back in a slanting direction toward the southeast by only about 6½ inches, and a crack running perpendicularly upward began to show itself in the brickwork at the hight of the center of gravity. The chimney was in this unsatisfactory state on July 21. Decisive action became necessary, and it was resolved to at once blow out the furnace. The next day the chimney was mounted from the inside as far as the cutting, and the piece of brickwork left as above mentioned so successfully removed that on the same day, in the evening, the undercut part of the chimney turned back the thickness of the cutting. But as this was not sufficient, a second cutting was made at a hight of 184 feet, and a third at a hight of 223 feet, the whole work of straightening the chimney being completed by August 1. Although it was found impossible to make the chimney perfectly perpendicular, because the bend began lower than it was possible, with due regard to safety, to make the first cutting, the result of the operations was considered satisfactory. The stability of the chimney had been insured, and its outward appearance almost restored to the normal.

## New Railroad Office Building.

The Central Office building of the Baltimore and Ohio Railroad Co., at Baltimore, Md., is a magnificent structure. It is situated on a lot having a frontage of 102 feet 6 inches on Baltimore street, and 104 feet 2 inches on Calvert street. The building, as now completed, is seven stories in hight, including two in the mansard roof. The walls are faced with pressed brick laid in dark mortar, trimmed with Cheat River bluestone string courses, lintels and cornices, richly carved and molded, and panels of ornamental terra cotta distributed in the piers, under the window sills and over the dormers. The first story is faced with finely cut Woodstock (Md.) gra[illegible] taken from quarries on the line of t[illegible]re and Ohio Railroad. It is battered to form a base for the massive building above, and is enriched with a boldly curved cap course below the lintels, which are also finely carved, and is finished with a heavily mounted string course or cornice. The fronts are broken by slight projections in the center of each, carried up in the form of pavilions another story above the main roof, and by pilasters on the corners, through which the lines of the string courses are continued to mark the different stories. A bracketed cornice is carried around the whole building, broken only on the main front with a truncated pediment and richly sculptured tympanum, whence springs the mansard roof, crowned with a richly ornamented iron cornice and terra cotta cresting. The first story dormers of the mansard roof are brick and stone with terra cotta panels in the pediments, and those of the second story are of iron inclined with the roof, and painted with the rest of the iron in two shades of buff. The main entrance is made a very prominent feature of the Baltimore street front, extending as it does through the first two stories, with massive granite pedestals on either side. Great care has been taken to make the building fireproof throughout. The walls are entirely of hard brick laid in cement. Heavy iron floor beams and girders, rolled at the company's mill at Cumberland, filled in with concrete hollow blocks, incasing and protecting them from the action of fire, are employed. The roof is entirely of iron construction filled in in a similar manner, and covered with cement and slate on the steep sides and with Seyssel mastic roofing on the flat. The designs were prepared by the company's architect, Mr. E. F. Baldwin, and the building was erected under his supervision and that of Messrs. S. H. & J. F. Adams, superintendents and builders. The material was furnished from Baltimore and from points along the line of the company's road. The carpenter's work was done by men employed by the company, under the supervision of Mr. William Allen, foreman.

## Proposed Changes in the New York Building Law.

The New York Legislature has now under consideration a law providing for the better protection of life in theaters, tenements and other buildings. It provides:

*First.*—Against building on frozen foundations.

*Second.*—For an examination of sand, brick and other material used in construction; also for proper bearing of girders on walls, which the present law does not do. It further provides a simpler and better way of determining the strength of cast-iron posts and columns.

*Third.*—That iron shutters on the center windows of the front of buildings above the first story shall be left open, to be closed by the firemen when needed.

*Fourth.*—That the inclosure of all elevators hereafter to be put in shall be of brick or fire-proof material.

*Fifth.*—That the flues of all furnaces and boilers shall be double, or they shall have a lining of firebrick.

*Sixth.*—The bill prohibits the erection of frame buildings below One Hundred and Forty-Ninth street, and prevents the erection of frame tenement houses above that line. It also provides that in tenement houses where more than three families occupy the same floor the stairs, the bulkheads and the inclosures thereof shall be fire-proof.

*Seventh.*—It adds to the present Board of of Examiners a representative of the Society of Architectural Iron Manufacturers, and provides that, in case of the condemnation of a building, their report shall be posted on the building. In addition, it generally lessens the labor of architects and builders by putting in the law many things that were formerly left to the discretion of the inspector or superintendent.

A site for the Army Hospital, for which an appropriation of $100,000 was lately made by Congress, has been selected in the southwest corner of the Government reservation, at Hot Springs, Ark.

## NEW PUBLICATIONS.

MODERN SURFACE ORNAMENT. Portfolio of 24 Plates. Size, 12½ by 15¾ inches. Published by J. O'Kane. Price, $6.

This work contains a great variety of detail ornament, such as panel and corner filling, borders, centers, diapers, &c., all of original design by artists of undoubted standing, and mostly prepared specially for this work. A number of the plates have the names of the artists who prepared the design, and among others we notice the names of Charles Booth, W. H. Wood, Arthur Halliday, George E. Harney, Louis D. Berg and O. S. Teale.

STUDY-BOOK OF FURNITURE AND FURNISHING. Size, 12½ by 17½ inches. Published by J. O'Kane. Price, $20.

This portfolio contains a series of 56 plates of designs showing interiors, cabinet work, upholstery and sundries. Of the special subjects treated we can notice only a few. An ebony cabinet, by H. W. Batley; hall and stairway, with terra-cotta details, by E. W. Poley; drawing-room interior, by Owen W. Davis; library chimney-piece, by W. Young; mantel work, table, reading chair, cabinet and bookcase, by various designers; dining-room decoration, by B. J. Talbert. This list will be sufficient to give our readers a general idea of the contents of the volume. The designs for the most part are in elevation, with sections and details drawn to a little larger scale, although a number of perspectives, particularly of rooms and interiors, are introduced. This volume cannot fail to be of interest to all cabinet-makers, as well as to architects who are engaged in designing furniture and interior finish.

DETAIL ORNAMENT. 24 plates. Size, 12½ by 15¾ inches. Published by J. O'Kane. Price, in portfolio, $6.

The title selected for this portfolio of plates is a broad one, and can be made to cover almost every subject. The work has been handsomely produced by the Osborn process of photo-lithography, and shows up the designs in a very satisfactory manner. Birds, flowers, conventional ornamentation, geometrical patterns, all receive attention, and while not, perhaps, exhaustively treated, are shown in such variety as to be of great service to those who have occasion to study decorative design, either for industrial purposes or otherwise. This work was originally issued in six parts of four plates each, and in that form is no doubt known to many of our readers.

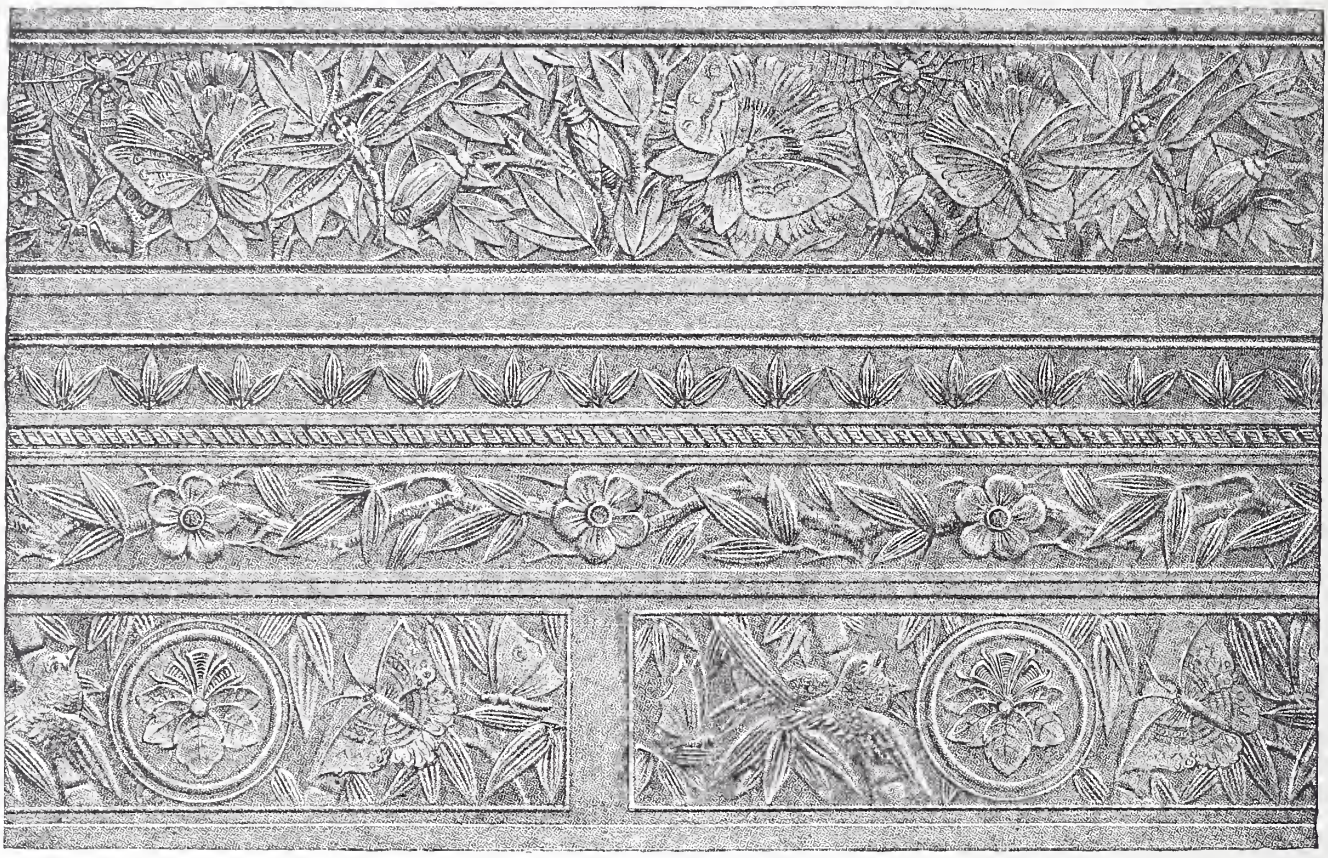
FASHIONABLE FURNITURE. A collection of 350 original designs representing cabinet work, upholstery and decoration. Size, 8½ by 12½ inches. Published by J. O'Kane. Price, $8.

The plates in this work, which number no less than 116, are by various designers, including 100 sketches by the late Bruce J. Talbert, architect; also a series of domestic interiors by Henry Shaw, architect. A very limited amount of letter-press accompanies the plates. An index and analysis of styles, however, are of undoubted advantage to the book, and add greatly to the facility with which it may be used. The general subjects are classified in this index under the heads of hall, study and library, dining-room, drawing-room, and bedroom. The styles are classified under the heads of "Tudor," "Jacobean," and "Old English," "Queen Anne," Chippendale," "Adams," "Anglo-Japanese," and "Italian Renaissance." From this tabular statement of the contents of the book it appears that the plates contained in it predominate largely of "Jacobean" and "Old English," and "Queen Anne." "Tudor," "Adams" and "Italian Renaissance," each have three plates. Besides the subjects above mentioned, under the head of sundries there appears designs of a pianoforte case, some clock cases, a billiard-room, an office, and some upholstered goods, together with draperies and fringes. The work, as its title indicates, is one specially useful to furniture designers and those who are studying the selection of furniture. The series of domestic interiors, by Henry Shaw, will be found of interest and value to designers generally.

## NOVELTIES.

### Lincrusta-Walton.

There has lately been introduced into this country an English material for wall and ceiling decorations which in many respects is of surpassing excellence. In the accompanying illustration we show a combination of several patterns of this material, selected from a great variety of designs, each excellent. It gives all the effect of elaborate and elegant carving at moderate cost, admits of any color treatment which may be desired, and possesses marked hygienic advantages in being non-absorbent and impervious.



*Novelties.—Fig. 1.—Lincrusta-Walton.*

This material occupies a place peculiarly and exclusively its own. It cannot be said to be a substitute for wall-paper, for it is so different that a comparison between them is impossible. As a material it more nearly resembles embossed leather than anything else, but as a wall covering it may be used as a substitute for wood, plaster or metal. It is a composition consisting chiefly of linseed-oil hardened by oxidation, spread on a back of stout canvas, and while plastic embossed by pressure under dies engraved with the best designs obtainable. It is a good deal like linoleum in its general character, but the absence of cork in the composition gives it a finer texture. There is scarcely a limit to the variety of beautiful effects which can be secured with color, bronze and gold in this material. It can be made to imitate carved wood so perfectly that panels of it may be held in position by wood-moldings without showing any difference between them which the eye can detect. With bronze and gold perfect imitations of tested in England and on the Continent, and has met all the requirements of a perfect wall covering. It is controlled in this country by the Lincrusta-Walton Manufacturing Company, whose offices are at 41 Union square, New York. Sheets illustrating the various designs thus far made have been prepared for the use of architects and decorators, and, with samples of the material itself, will be forwarded to any address upon application.

### A New Device for Fastening Saw Handles.

Our attention has been drawn to a very neat little device for fastening the handles of saws, which is now being turned out by Mr. William McNiece, of Philadelphia, Pa., and a clear idea of which will perhaps be most readily gained by referring to the engravings, Figs. 2 and 3. As an inspection of the illustrations will show, the appliance consists of two strips of metal bent in the shape shown, and the ends of which are provided with holes for the insertion of bolts. The saw handle is provided with corresponding holes, and by placing one strip on each side of the handle, and tightening up the screws shown, the former may be fastened to any required extent. The principal features of the saw clamp are that it can be separated from the handle and saw blade in a very short time, and these, when separate, can be placed in the tool-chest more conveniently. The bolts employed can be made much stronger than regular saw screws are ordinarily turned out, and will consequently keep the saw blade in position more firmly. An additional advantage is that, whenever the saw blades become loose from long-continued work, a comparatively short time is needed to tighten them, the only instrument necessary being an ordinary screw-driver.

*Fig. 2.—New Device for Fastening Saw Handles.—The Article Applied to a Panel Saw.*

### An Improvement in Cross-Cut Saws.

We illustrate in Figs. 4 and 5 an improvement in cross-cut saws which is entitled to more than a passing notice. While the invention is simple in itself, it is radical, and accomplishes desirable results not apparent at a glance. The manual labor required to operate cross-cut saws is of the most severe kind, and any improvement tending to reduce it is a boon to the users.

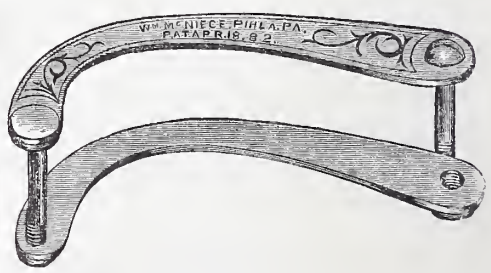



*Fig. 3.—New Device for Fastening Saw Handles.*

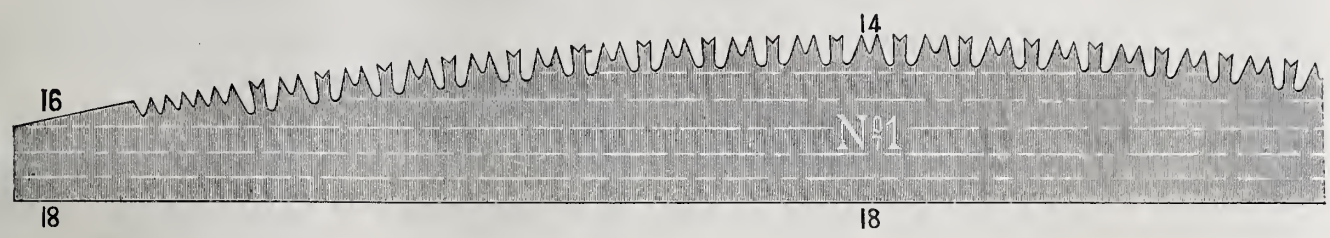
Cross-cut saws were originally made of a straight plate of steel of even thickness throughout, with teeth cut on one of its edges, Experience soon discovered that a curved cutting edge was desirable, both as to ease of working and to quality of work

produced. The fact that a log would sag or drop a trifle when nearly cut in two, binding on the saw, and retarding or entirely stopping its movements through the log, suggested the necessity of making the back edge thinner than the tooth or cutting edge, and machines were constructed to do the work, the saw passing over the grindstone in straight lines, as indicated in Fig. 4. There has been a gradual demand for saws with more curve on the edge, and more difference between the thickness of the back and the teeth, until the bulk of saws now sold are nearly or quite straight on the back, and very rounding on the edge, and beveled four gauges from edge to back. As a result, saws made 14 gauge thick at the center of the edge of the saw, and beveled to 18 gauge at the back, will be but 16 gauge thick at the teeth near the end of the saw--or, in other words, the teeth vary two gauges in thickness on the edge of the saw, as shown by the gauge figures on the cut.

The improvement consists in grinding the saw in crescent lines parallel, or substantially parallel, to the cutting edge, as shown in Fig. 5, in which case the edge or teeth are of even thickness, while the inequality is thrown into the back, and while the thickness of the saw remains the same across its center as when ground the old way, the ends are increased two gauges in thickness. The advantages derived from this method of manufacture are:

1. The saw does not bind in the kerf, as others, in consequence of being of even thickness throughout the cutting edge. 2. It requires less set, for each tooth does an equal amount of work, and has equal thickness or strength to hold the set required for clearance 3. Being two gauges heavier at the ends, the strain of the saw is equalized throughout its length, and is easier handled out of the cut. 4. It will hold its set longer, as, being of equal thickness throughout its length, the wedge strain is taken away from the sides of the teeth. 5. It requires less power to run it, for the reason that it cuts a narrower kerf, and less timber, and also making an even, instead of a varying, kerf, it does not cut and recut at each passage of the saw, as is the case with others. 6. It cuts smoother, and does not mar the sides of the kerf, from the fact that, the saw being stiffer at the ends, the operators can push as well as pull without causing a curvature in the saw. 7. It will not kink as easily as saws ground by the old method, as the taper from edge to back, being at right angles to a tangent of the cutting edge, serves as a brace to the saw.

It is claimed that by actual experiments in the Northwestern pineries the crescent ground saws cut from 10 to 15 per cent. more timber than the straight ground, and with much less labor, and in felling trees they are especially advantageous. These saws are manufactured by the Simonds Manufacturing Company, of Fitchburg, Mass., who have a branch house and factory in Chicago, and who have achieved during the past five years a somewhat remarkable success in a new method of manufacture of circular and other descriptions of mill and cross-cut saws. Patents were issued December 26, 1882, to George F. Simonds, president of the company, on this saw, and the method and machinery by which they are produced.




*Novelties.—Fig. 4.—Improvement in Cross-Cut Saws.—Illustration of a Saw Ground in the Usual Way.*

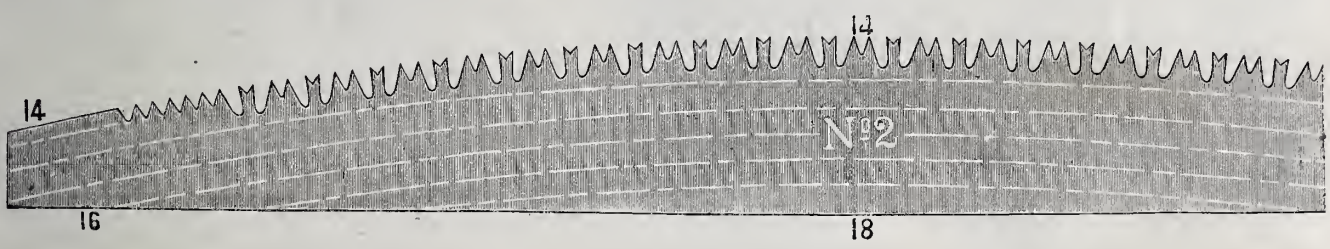



*Fig. 5.—Illustration of a Cross-Cut Saw Ground in Lines Parallel with the Cutting Edge.*

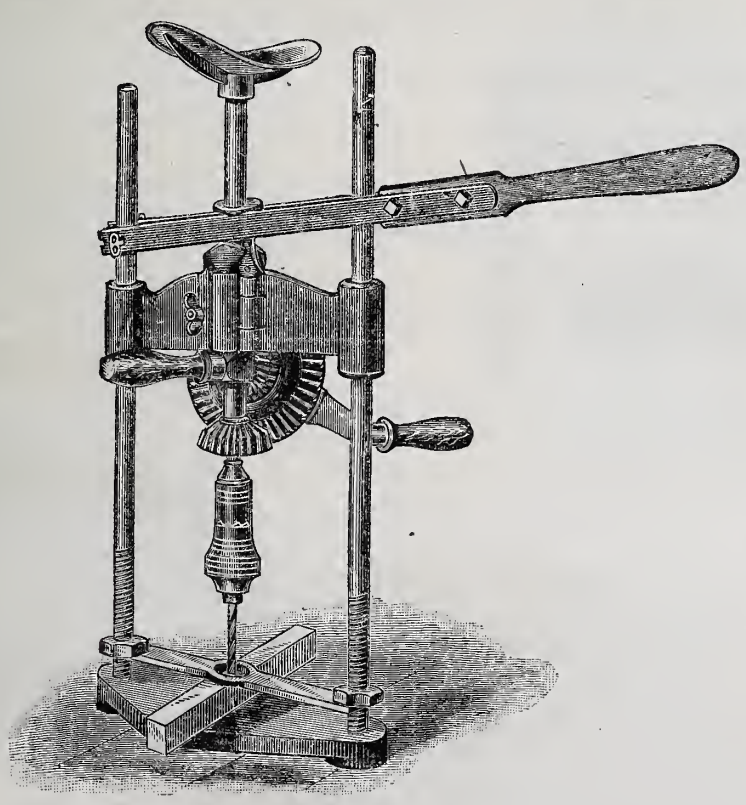


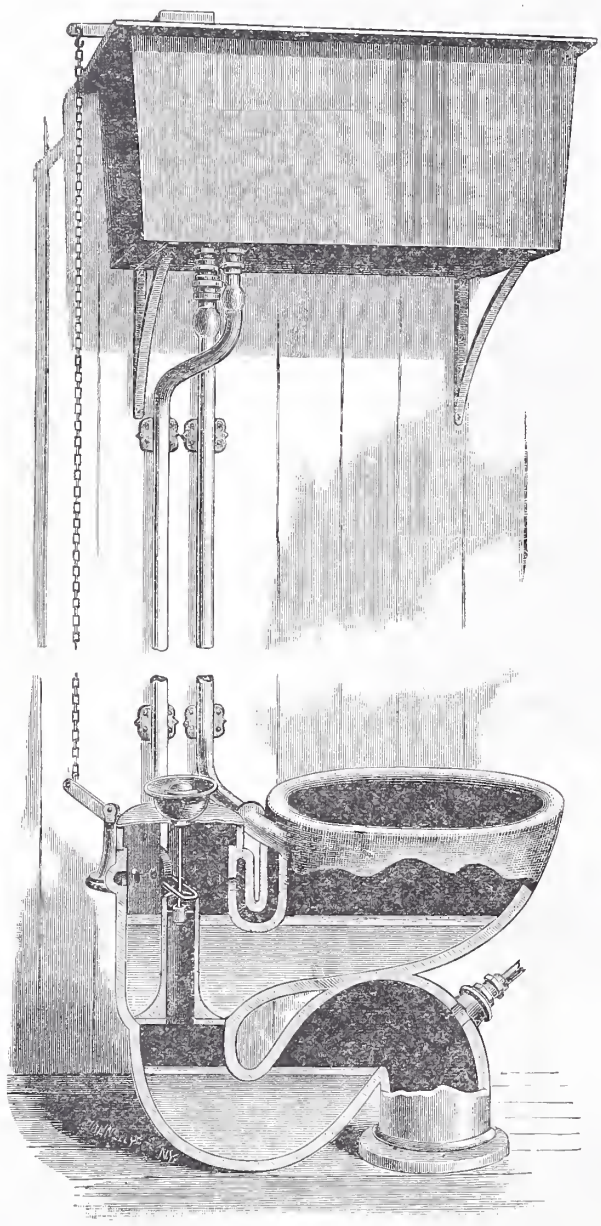
*Fig. 6.—Mounted Breast Drill, Manufactured by the Millers Falls Co., New York.*

### Mounted Breast Drill.

A novelty now being put upon the market by the Millers Falls Company, whose office is 74 Chambers street, this city, is shown in the accompanying illustration. A steel frame is provided, in which the No. 10 breast drill manufactured by this company may be used quite advantageously. The engraving shows the arrangement of parts so thoroughly that very slight description is necessary. The upright rods of the frame are of ⅝-inch round steel, 16 inches high, and are placed 8 inches apart. The drill is held true by the frame, and the work is held firmly in place by the clamp shown in the engraving. The lever-feed provided by this arrangement may be operated by hand, or a weight may be employed, as may be preferred. The drill-stock is of ⅝-inch round steel, nickel-plated. The gears are cut, and are changeable from an even speed to one of three to one, as may be desired. The drill-stock can be put in or out of the frame by a half-turn of the thumb-nut, shown to the left in the engraving. The advantage of an attachment of this kind for use in connection with a breast-drill is obvious. Most of the work done by a tool of this character can be better performed with the drill mounted in the frame. When the breast-drill is used in the ordinary manner it very frequently requires heavy pressure, which is quite fatiguing to the workman. In the arrangement shown there is a leverage of five to one, which makes the feeding an easy matter. When work is required that cannot be done in the frame, the tool can be taken out in a very small space of time, and used in the ordinary way.

### Myers All-China Water-Closet.

The accompanying illustration represents a new all-china water-closet which is brought out by Mr. A. G. Myers, of 94 Beekman street, New York. In this closet, as its name indicates, the whole of the internal work, including the trap and valve sections, are made of china. This closet has, in addition to its other advantages, an all-china flushing rim for the distribution of the water on the whole inside surface of the bowl, and also around the valve section a series of perforations opening into a water channel by which the inside of this section and the surface of the valve are flushed at the same time as the interior of the basin. The object of this flush is to thoroughly wash the valve, and, in fact, all portions of the closet against which soil or paper can come in contact. The advantages of this form of closet scarcely require mentioning. There is, of course, no liability for the joint between the earthenware and the iron to be broken, since the whole closet is made in a single piece, and the putty has no opportunity of cracking or leaking or becoming saturated with foul matter. When it is desired, the closet can be supplied with a solid plunger and an independent overflow. The vent at the dome of the trap is either 1¼ or 2 inches. The supply pipe to the tank is ½ inch. It will be noticed that a tank is used, doing away with the annoyances of the old style of valves. The tank itself is so arranged that at each pull of the handle 1½ gallons of water are sent into the closet with great force. The valve arrangements of the tank, however, are so constructed that a greater or less supply can be obtained when desired. This tank is very ingenious, and performs its work in an exceedingly satisfactory manner. From all that we can judge by observation, the closet appears to work in a very satisfactory manner, and we presume the washing arrangement on the plug will remove a good deal of the objections hitherto urged against this feature of the side-opening basin.



*Novelties.—Fig. 7.—Myers All-China Water-Closet.*

### Tallying Instrument.

The Benton Manufacturing Co., of 30 Cortlandt street, New York City, are supplying a convenient tallying instrument, the general character of which will be understood by reference to Figs. 8 and 9, the first of which represents a face view, showing the position of the thumb in operating it and the figures in the dial. The succeeding engraving shows the back of the instrument, the ring through which the middle finger of the left hand is passed in operating it, and thumb-screws for setting the figures. The engravings are a little less than full size. The instrument may be suspended by a cord around the neck, or it may be safely carried in the pocket, as may be preferred. Its convenience in tallying goods, counting bill stuff, and in many other directions, will be appreciated by all who have work of this character to do. Instead of burdening the mind by recollecting a number and adding thereto, all that is necessary is to press the spring by means of the thumb for each additional item. The form in which the instrument is here shown adapts it for use in the hand, and for carrying in the pocket. By arranging it in a way that would naturally suggest itself to any mind of an inventive turn the device can be made automatic in character, and thus tally in various positions where the services of an instrument of this kind are valuable.

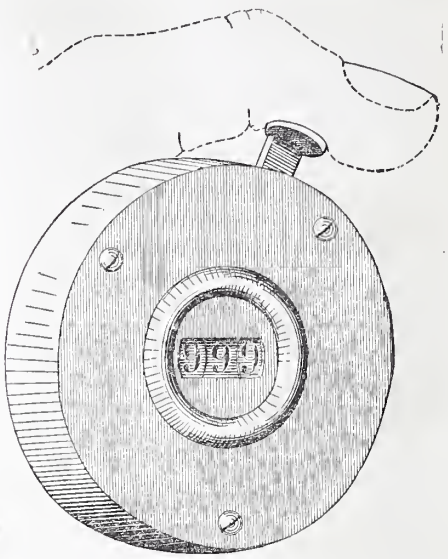


*Fig. 8.—Tallying Instrument.—Front View, Showing Dial and Manner of Operating.*

### Improvement in Braces and Wrenches.

The Smith & Egge Manufacturing Company, of Bridgeport, Conn., are offering an improved form of bit-brace, also a socket-wrench, the two embodying a common principle which possesses interest for our readers. The general appearance of these tools is clearly shown in Figs. 10 and 12, while sections showing their construction are given in Figs. 11 and 13. The design of the manufacturers has been to produce something cheap in construction and at the same time effective for use. The clutch is formed by splitting the shank of the tool and placing between the two parts a thumb-wheel, the two ends of the spindle of which are provided with right and left threads. By this simple device the jaw of the clutch is very rapidly opened or shut, according to the direction in which the thumb-wheel is turned. The application of this principle to the brace and socket-wrench is essentially the same, there being only a slight difference in detail, as may be seen by comparing Fig 11 with Fig. 13. The recess in the clutch of the brace for grasping a bit is made in such a form as to take in the square shank, the clutch shutting down over the round part of the bit, thus making it secure in its position without liability of dropping out, even though the screw is not closed down tight. The thumb-wheel of the clutch in the brace may be operated by bringing it in contact with the bench, thus enabling a mechanic to fasten the bit in position or withdraw it from he brace with ease and dispatch.

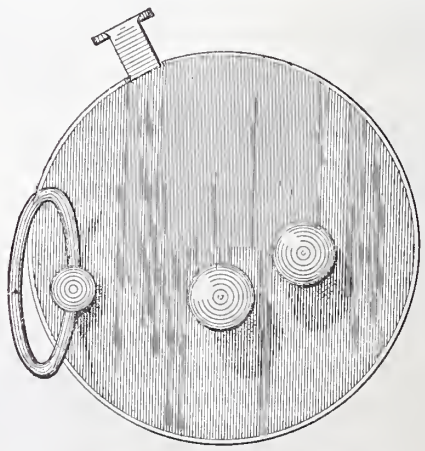


*Fig. 9.—Back View of Tallying Instrument.*

### Kennett's Shingling Bracket.

Among the novelties now being offered to the trade is Kennett's shingling bracket, recently improved, an illustration of which is afforded by Fig. 14 of the engravings. The manufacturers, Messrs. Hetzel & Williams, of Syracuse, N. Y., claim for this device simplicity, reliability, durability and cheapness. As may be seen by the engraving, it consists of a foot-piece which, slipping under a shingle, supports a bracket that carries a lever. The lever, by the action of the weight pressing against it, clamps against the top of the shingle. The foot-piece is provided with a saw-tooth edge inclined downward at such an angle as to cause it to obtain a purchase against the lower shingle.

*Novelties.—Fig. 10.—Improved Brace, Manufactured by the Smith & Egge Manufacturing Co.*

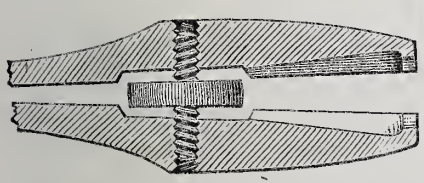


*Fig. 11.—Detail of Clutch of Brace.*

The more weight that is brought against the support thus provided for the scaffold, the tighter it clamps the shingle, and any tendency there may be to slip causes the toothed edge to plow into the lower shingle. A special merit that this shingling bracket possesses is the compact form in which it is constructed and the convenience with which it may be transported from place to place in an ordinary tool-chest. The engraving represents the article a little less than one-half size, the dimensions being as follows: Length of foot-piece, 3 inches; total hight, with lever extended, 4½ inches.

*Fig. 12.—New Form of Socket Wrench.*

### New Sources of Timber Supply.

There is a good deal of Southern timber land now being held by Northern men who bought it up years ago for a mere song and are now awaiting the returns which will be sure to come. Kentucky has for a number of years past supplied our market with hardwoods. This State has a good supply of walnut, some of which is as good as the Indiana, but some is also very poor. There is also in the State a fair supply of walnut and cherry, but not much ash or oak. Tennessee is also shipping considerable hardwoods, principally walnut and whitewood. This State has also a very good supply of lumber. West Virginia has shipped mainly whitewood of a pretty good quality to the market and Virginia has shipped whitewood and some cherry. All these States are well timbered, and lumbering operations are only just fairly begun. The lumber is in many cases of very good quality and equal to Indiana lumber, but in many cases it is also very poor.

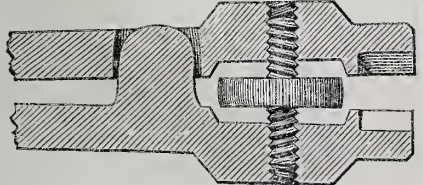


*Fig. 13.—Detail of Socket Wrench.*

Better timber may be found after awhile. The chief points of its inferiority to Indiana lumber are that it has more sap, it is in many instances chippy or close grained and harder to work; it is also more apt to twist when drying. The lumber when brought on the market is graded poorly, in some cases only about one-third of a car of what they call good lumber being regarded as such in this market. The millmen lack the experience and skill of the Northern manufacturers in the handling of the lumber, but the influx of Northern millmen and time will remedy this. There is some Arkansas walnut brought to this market, but the amount is small as compared with what the other States send. This State is an important lumber field of the future, being heavily timbered with walnut which is equal in grade to that of Kentucky or Tennessee. The heavy freight by railroad is a serious obstacle to shipping a great deal at present to this market, but there is considerable floated down the Mississippi and then brought by ship to Boston.

Indianal umber brings from $5 to $15 per thousand more in this market than Southern lumber, and the freight is also cheaper. The freight of a carload of lumber from Indiana is $80, while from Kentucky it is from $100 to $110; from Tennessee, $120 to $130; from Arkansas, $150, and from Virginia and West Virginia, about $80. However, the first cost of lumber in Indiana is more, and $85 per thousand is paid for walnut against $70 for walnut in Tennessee. Whitewood costs about $26 per thousand, against $23 in Kentucky. As the Indiana woods grow scarcer, the price will probably rise still higher, as owing to its acknowledged superiority it will be taken at almost any price. It does not follow that the prices of Southern hardwoods will rise in proportion; on the contrary, perhaps, they will fall, for, now that the railroads have penetrated the timber region, lumber, and a greater amount of it, can be brought more easily to market. Owing to the thinning out of the forests of the North, it is therefore to the South that the country must now look for its future supply of hardwoods, and though, perhaps, the quality be not so good, the quantity is sufficient for years to come.

### Prevention of Theater Fires.

The Building Act Committee of the Metropolitan Board of Works, London, in a recent report to that body, stated that they had carefully considered the question of the present arrangements for the egress of the public from, and the prevention of fire in, the Royal Italian Opera, Covent Garden, and that they were of opinion that the following alterations of a structural character should be made by the owner, in order to remedy existing defects in the building: That a proper proscenium wall be built to divide the stage from the auditorium; that such wall be carried down to the level of the foundations, and carried up to the hight of 3 feet above the highest part of the roof to which it adjoins; that a wall be built in continuation of the proscenium wall under the proscenium opening, such wall being carried up to the under side of the stage and carried down to the level of the foundations, and that all openings in this wall, and in the walls dividing the dressing and other rooms at the side of the stage from the staircases adjoining, be closed by wrought-iron doors in wrought-iron frames, fitted without woodwork and hung so as to shut automatically; that the floors of so much of the workshop and storerooms in the roof of the theater as extend over the auditorium be formed of fire-resisting materials, or covered with Drake's concrete slabs; that an additional staircase, with the necessary exits, leading directly into the street, be provided from the gallery and the amphitheater on the south side of the house; that strong hand-rails be fixed on both sides of all staircases where not already provided, and that a central double hand-rail be fixed to the grand staircase; that the doorways between the theater and the floral-hall be closed with wrought-iron doors in wrought-iron frames, fitted without woodwork and hung so as to shut automatically; that the doors throughout the building be made to open outward; and recommending that a draft notice embodying the above requirements be prepared by the solicitor; that the clerk be instructed to transmit a copy of such notice to the owner, with an intimation that he may submit to the board any observations thereon; and that the Building Act Committee be authorized to confer, either directly or through their sub-committee, with the owner upon the board's requisitions, and to report further to the board on the subject. Recommending that the board, in exercise of the authority conferred upon them by the 45th Section of the Metropolitan Board of Works (various powers) Act, 1882, do make the following rules, with respect to Covent Garden Theater, for the safety of the public: That notices be legibly painted upon the exit doors of the theater stating that they may be opened by any one in case of an

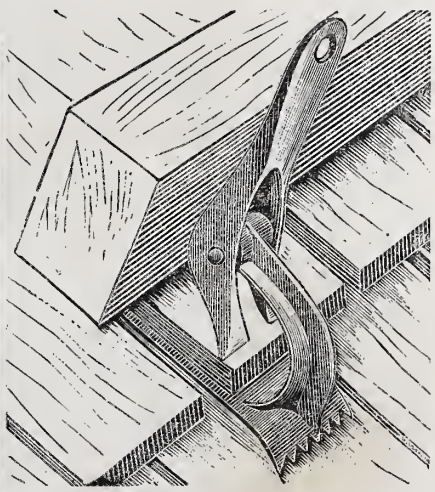


*Fig. 14.—Kennett's Shingling Bracket, About Half Full Size.*

emergency; that exit doors be secured by bolts only, to be shot by a handle to be placed at a hight of 3 feet from the floor; that notices be also placed in the various corridors, indicating the direction of the several exits; and further recommending that a notice in writing to this effect be prepared by the solicitor, sealed in duplicate, and served upon the owner of the theater; and that the assistant architect be authorized by the board, in writing, to survey the theater from time to time and report whether the rules made by the board have been observed. Mr. Shepherd moved the adoption of the report and recommendations, which was unanimously agreed to.

## Painting the Dome of the Capitol at Washington.

As you stand at the foot of the terrace below and look up at the immense dome of the Capitol, the workmen there seem midgets, clinging by toes and finger tips to the convex surface. To the nervous spectator the sight is more exciting than interesting. The narrow landings surrounding the lower and upper ends of the dome appear as threads of white marble on which hardly a fly could obtain a secure foothold, much less a man. You shudder as you see a human form uprear itself from the interior of the cupola and with apparent carelessness climb backward over the narrow ledge to the ladder beneath. The ladder seems fearfully small and unable to support the weight of or give foothold to several men who are upon it. They lean forward at times until only their feet and one hand are on the ladder as they run their brushes over that part of the dome within reach. They seem suspended in mid-air, and you tremble lest the next blast of the wind, which, you know, blows fearfully hard up at that dizzy elevation, should loosen their frail hold and dash them, shapeless masses, against the cold, cruel stones of the pavement, 200 feet below. Suddeuly, while you gaze, one of them rapidly descends the ladder to the lower landing, which is in reality about 18 inches wide, but seems to you a mere line, and lightly, recklessly even, jumps down upon the projecting edge of the column immediately below. You notice, however, that he climbs back with much more care. And you watch with a sort of fascinating interest till the eye grows dim with its constant gaze, and you seek inside for further information.

Dangerous as this work seems to be, very dangerous as it is in fact, a more gruesome job is that of painting the pedestal on which the Goddess of Liberty stands. The statue is of bronze, the pedestal of iron, and the latter must be frequently painted, so as to correspond in hue with the goddess. From the very top of the dome the cupola uprears its graceful proportions without any interior means of access to the statue's pedestal. Ascent must be made vertically from the outside. When the pedestal is to be painted, riggers from the Navy Yard are detailed to erect a temporary structure by which the workman ascends to the top of the cupola. To climb over the outside legs of the latter, either in coming down or going up, is said to be the most dangerous undertaking. So hazardous is the entire job of painting the pedestal that only one man on the force will do it. He is a native of Capitol Hill, and is said to be utterly indifferent to danger, apparently unconscious that he runs any risk whatever.

## Exit Doors for Public Buildings.

According to the *National Zeitung*, the German Government authorities have been giving attention to exit doors of churches, with the view of avoiding loss of life in case of panic due to alarm of fire, and it has been recommended that in all new churches the entrance and exit doors should open outward. When this is not found practicable it is suggested that doors to exclude draft should be provided that would open outward, and that the main doors should be kept open throughout the entire service. We think it a little surprising that this matter should not long ago have received attention from a paternal government like that of Germany, and that they should now be suggesting such very crude methods as this paragraph indicates. The subject of exit doors for places of public assemblage, whether churches, halls or theaters, is one which should receive intelligent attention, and we shall be very glad to have from our readers suggestions on this point, with drawings, giving their ideas of the best method of constructing such doors.

## Brickmaking Machinery.

Mr. P. Barnes, in an article contributed to the *Industrial World*, says: It would certainly not be safe to say that none of the brick manufacturers in the city of Chicago are familiar with the possibilities of brickmaking machinery, in view of the recent strike among their workmen. It would be safe to say, however, that not one of them ought to permit himself to remain ignorant of the excellent results obtained in some parts of the world with brick machinery of the better class for a day longer than is needful to get hold of the required lines of information. These lines are many in number, though they do not all lead to useful results to the manufacturer, who, above all things, must make his business pay. Some of the machinery used will work profitably and some will not, a very important part of this difference lying in the correctness of the plan of the machine, and another equally important part being the difference in the strength of the whole.

No attempt need be made to describe here any particular machine, either of American or foreign make, but it is the intention of this writing to note and urge the possibilities of the case and the importance to manufacturers of securing, by the use of more perfect machines, that vital element of all profitable working, viz., an uninterrupted continuance of all parts of their operations. Workmen who think they are hardly dealt with may be able to stand a stoppage of work, but the owner must see trade slipping from his grasp and an important fraction of a season forever lost for want of machinery that shall do what is conceded to be very nearly the crudest kind of manual labor that is known, next in order, probably, to the handling of pick and shovel itself. It is true that this very fact of the rough and common character of the work itself must always stand in the way of the use of the more complete and costly kind of machinery, for, as a rule, employers think that mudlarks can always be had for the asking and at low prices. True enough, they can be had, generally, but the exceptional season furnishes a powerful argument for the use of machinery that shall save the loss of valuable time, and the equally important loss of contracts, perhaps for the whole season.

In few words, the chief preference between the best brick machines lies in the choice between continuous working after the fashion of a coffee mill or more like a sausage stuffer, and the machine which fills the molds separately and stops, in part at least, for an instant to press the brick in the close mold. So long as a perfectly uniform and solid brick is needed, and it always must command a preference, so long probably the brick machine which can give a certain and definite pressure to the brick must be chosen. This pressure in a closed mold, a very heavy machine pressure of some tons in weight, can be given, too, with far less expenditure of power, and less wear upon the machine, when the press part of it is at a standstill. Some machines undertake to press the material while the mold is moving toward the point of delivery, using steel shoes or friction rollers to reduce the wear, but with poor effect. If, on the other hand, this final pressure to the molded clay be given while the mold-box stops for a moment, then any required effort can be expended upon it with no appreciable wear whatever.

The choice between half-dry clay and half-wet clay for use in the machine, if the difference may be stated in that way, has led to some disputes among makers of such machines, and probably to the utmost diligence on the part of all concerned to make both methods work perfectly. Probably the difference lies, as with many similar things, more largely in the care taken to do the work well, and to make not only the best brick which the machine as set to-day will make, but rather a brick which shall meet the full requirement of a high standard. It is probable, too, that the clay must be wet enough to insure what may be called, perhaps correctly, a perfect welding of the particles to each other, and it is evident that a degree of dryness may be reached at which, however great the pressure put upon the mold, no such joining or adhering of particles would take place. The choice as to the use of wet or dry molding would be likely to lie also, even with the best machines, in the character or the composition of the clay itself.

All these considerations have their weight, and have, no doubt, been carefully noted by many manufacturers, but the help likely to be derived in their business from the use of such machinery is by most of them counted as really of little avail, and on the whole not worth seeking for. It is nevertheless true that instances can be found in which an amount of money even less than had been lost in a single strike or stoppage of work, judiciously spent, has provided means for preventing forever any further delay in that particular line, so far as any unwillingness or inattention on the part of the men is concerned.

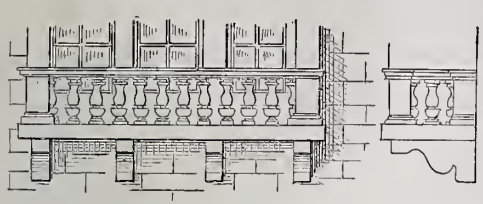
## Stories in Stone.

The Chico (Cal.) *Record* states that Prof. A. L. Knowlton has just placed among his numerous geological collections a fine relic of the Stone Age. The specimen is a stone scoop, resembling the kind used by grocers, and is about ten inches in length. The scoop is of a granite formation, and was discovered by B. F. Billingsley in the mines at the junction of the Brush and French creeks, in that country, at a depth of 15 feet below the surface of the earth. Another scoop was found near the same place, which was of a different pattern and much finer workmanship, and also of a different formation, but unfortunately it has been lost. The scoop which Professor Knowlton has received appears to have been pretty roughly handled by the action of water and gravel. It has been thrown among rocks by the water, and in its tumblings has had small pieces broken from either end. Mr. Billingsley also sent down some beautiful specimens of crystal quartz which he found in the French Creek country. He has discovered there some queer relics, among them being pipes, axes, mortars and pestels, and bushels of arrow-heads. There is a large mound there on one of the ridges lying between two deep cañons, which is thought to contain relics of mound-builders. For a long time past, several scientific gentlemen of the county have been discussing the subject, and have concluded that they will make some excavations, and perhaps bring to light many things of interest. It is probable that this mound contains tools used by a lost race of people, and perhaps their bones may be found there. In some parts of the Pacific Coast have been discovered mines which had undoubtedly been worked ages ago. Especially in the silver mines of Nevada are these evidences very plain.

## The Statue of Germania.

The great national statue of Germania, which is to be erected at Niederwald, near the Rhine, to commemorate the victory of Germany in the last Franco-German war, is now in process of being cast in separate pieces at Munich. The head and several other parts have already been completed. Some idea of the magnitude of this work may be gathered from the fact that the total weight of metal in it will amount to not less than 45 tons. In the work of casting and finishing as many as 50 men are often employed at one time. The gigantic head of the statue is already finished, and so is the powerful left arm, with hand, on the tip of one of the fingers of which rests the Imperial crown of Germany. Last week the workmen were engaged on finishing the right arm and hand grasping the handle of the sword. Other men were at work on the huge shoulder and breastplate, on which is the Imperial eagle. The largest single portion of the statue—the throne, with cloak

lying on it, the whole weighing 15 tons—has just been cast. The blade of the sword, which of itself weighs a ton, and which, enveloped in an oak garland, has been cast separate, is also finished. Part of the chain armor, with its free-lying texture of rings, is likewise ready, and is a beautiful



*Builders' Glossary.—Fig. 1.—Front and End Elevation of a Balcony.*

piece of workmanship. The other parts of the monument are being cast at different establishments in other cities. Thus, the figures of the Rhine and the Moselle, to be placed at the foot of the pedestal—the latter is 80 feet in hight—are being executed at Dresden, the *relievos* are being prepared in Berlin, the great Imperial eagle at Lauschammer, and the allegorical figures of War and Peace at Nuremberg.

## BUILDERS' GLOSSARY.

According to the announcement in a recent issue, we commence in this number the publication of a Builders' Glossary, in which we propose to define and explain such terms as may be proposed by our readers. As explained in the original announcement, we do this in answer to numerous requests from our readers for information. Instead of attempting to arrange the terms alphabetically, we shall insert them in any order most convenient, as we believe this will be of the greatest advantage. Since we propose to define as far as possible all the terms submitted to us, it depends upon our readers whether or not the Glossary shall be sufficiently comprehensive to be useful to them. We solicit correspondence with reference to it from all who are interested. We propose, so far as is practicable, to answer questions in the order in which they are received. We shall employ illustrations in this as freely as in other departments of the paper.

*Fig. 2.—Balustrade with Pedestals.*

In this connection it is only right to remind such of our readers as have enjoyed the advantages of a liberal education, or who have been extensive readers, that much that will appear from time to time may seem to them to be elementary in character. The design of the scheme is to help those who need help—not to inform those who are already well posted. In this work, as in all other departments of the paper, we solicit the co-operation of our readers. We shall fail of the greatest possible good unless we have their assistance. There are various special terms in use in the

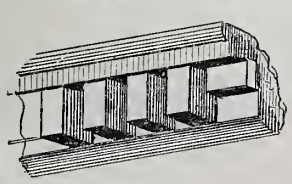


*Fig. 3. Section of a Dentil Course.*

building trades, definitions of which are not to be found in the dictionaries, and there are various localisms which, if presented in this department, will be of interest. We solicit contributions of odd terms with their meanings explained, as well as lists of terms to be defined.

BALCONY.—A platform or projection from the external wall of a building usually resting on brackets or consoles and having the sides encompassed with a balustrade. The word, referring to its derivation, conveys the idea of a scaffold, or of projecting beams. It was formally pronounced with the accent upon the second syllable, but during the past 50 years it has been accented upon the first. Our illustration shows a balcony of somewhat conventional form, but one which illustrates its general features.

BALUSTER.—A small column having a swelling in the middle, and moldings to form a base and capital. It is commonly used in a balustrade. This word is frequently corrupted to *banister* and *ballaster*. The lateral part of the volute of the Ionic capital is also called the baluster.

BALUSTRADE.—A row of balusters topped by a rail, serving as a fence or inclosure for altars, balconies, stair cases, tops of buildings, &c. Besides the uses just mentioned balustrades are often used as mere features

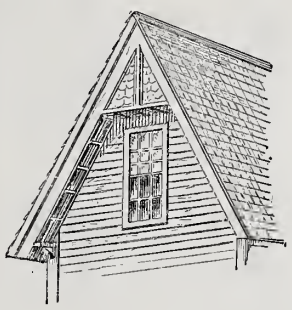


*Fig. 4.—A Gable.*

of embellishment. Hence in modern architecture there are frequent and radical variations from the classical styles. Our engraving shows a common form, the balustrade being terminated at each end by a pedestal.

PEDESTAL.—A substructure frequently placed under columns in classical architecture, and hence forming the natural divisions in balustrades which are frequently run between columns. The literal significance of the word is a foot column. A pedestal consists of three divisions, the *base* or foot the *dado* or *die*, forming the main body; and the *cornice*, which, when used in connection with a balustrade, corresponds with the rail. The dado or die is very frequently

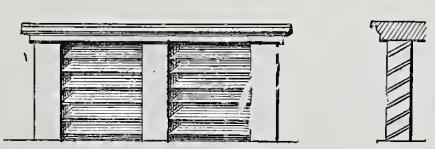


*Fig. 5.—Louver.—Elevation and Section Through a Louver Ventilator.*

paneled, as shown in Fig. 2, and otherwise ornamented.

DENTIL.—An ornamental square block or projection in cornices, bearing some resemblance to a tooth. The word in its original significance means a tooth. Webster gives the spelling of this word as we have it, but some of the English architectural dictionaries give it *Dentel*. The moldings in a cornice against which the dentils rest are frequently called the *dentil moldings*, while the same moldings, together with the dentils, comprise what is called the *dentil course*. The modifications of the dentil in modern frame architecture are almost beyond description.

GABLE.—The triangular end of a house or other building from the cornice, or eaves, to the top. This term was formerly sometimes applied to the entire end wall of a building, the top of which conformed to the slope of the roof which abutted against it. It is at present however restricted as above. In the former sense the large end-window of a building was often called a *gable window*. The term *gable* is not used in classical architecture, as the ends of roofs, when made in this way, are formed into pediments. A *gable roof* is the sloping roof forming the gable.

LOUVER.—An opening in the roof of ancient buildings for the escape of smoke and for ventilation, often in the form of a turret, or small lantern. The word is sometimes incorrectly written *lover*, *loover* and *luffer*. In modern architecture the term *louver boarding*, or *luffer boarding*, refers to the sloping boards as employed in a tower window and similar places. An elevation and section

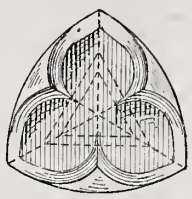


*Fig. 6.—A Trefoil.*

through a form of ventilator frequently employed upon factory buildings, which embraces this construction, is shown in Fig. 5.

FOILS.—The spaces between the cusps of featherings in gothic architecture. An ornament arranged with three spaces, as shown in Fig. 6, is known as a *trefoil;* with four (Fig. 7), as a *quatrefoil;* with five (Fig. 8), as a *quinquefoil*. When the ornament has more than five divisions it is known as a *multifoil*.

## A Venerable Piece of Hardware.

The original door-knocker brought over in the Mayflower, which for several generations was upon the front door of the old Winslow house, at Marshfield, still standing on the Webster farm, has lately come into the possession of the Rev. W. C. Winslow, of Boston, who will probably give it to the Webster

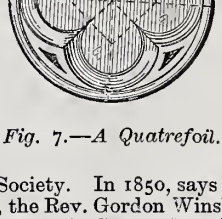


*Fig. 7.—A Quatrefoil.*

Historical Society. In 1850, says the Boston *Transcript*, the Rev. Gordon Winslow, D. D., rector of St. Paul's, Staten Island, while on a visit to Mr. Webster, was presented by him with the interesting relic. It is inscribed, "From Winslow House, Marshfield, Mass. Came in the Mayflower, 1620." And on the rim or head to receive blows of the hammer, the inscription runs: "Presented by Daniel Webster to Dr. G. Winslow, September 12, 1850." The door-knocker is of brass, but so incrusted with age that some Old Mortality will have to exercise considerable friction to bring back the original luster,

*Fig. 8.—A Quinquefoil.*

such as greeted the caller upon Governor Edward Winslow and Governor Josiah Winslow. Mr. Webster took great interest in the old mansion, which the builder and original owner named "Careswell," and looked upon this relic as among the most valuable souvenirs of the Mayflower and the Pilgrim age. As will be remembered by some, the Webster tomb is in the Winslow burying-ground, near the tomb of Governor Josiah Winslow, whose coat-of-arms—the crest being a tree cut short, but spouting out, and motto, *Decarptus Floreo*—are as clear and distinct as if put there but yesterday.

## CORRESPONDENCE.

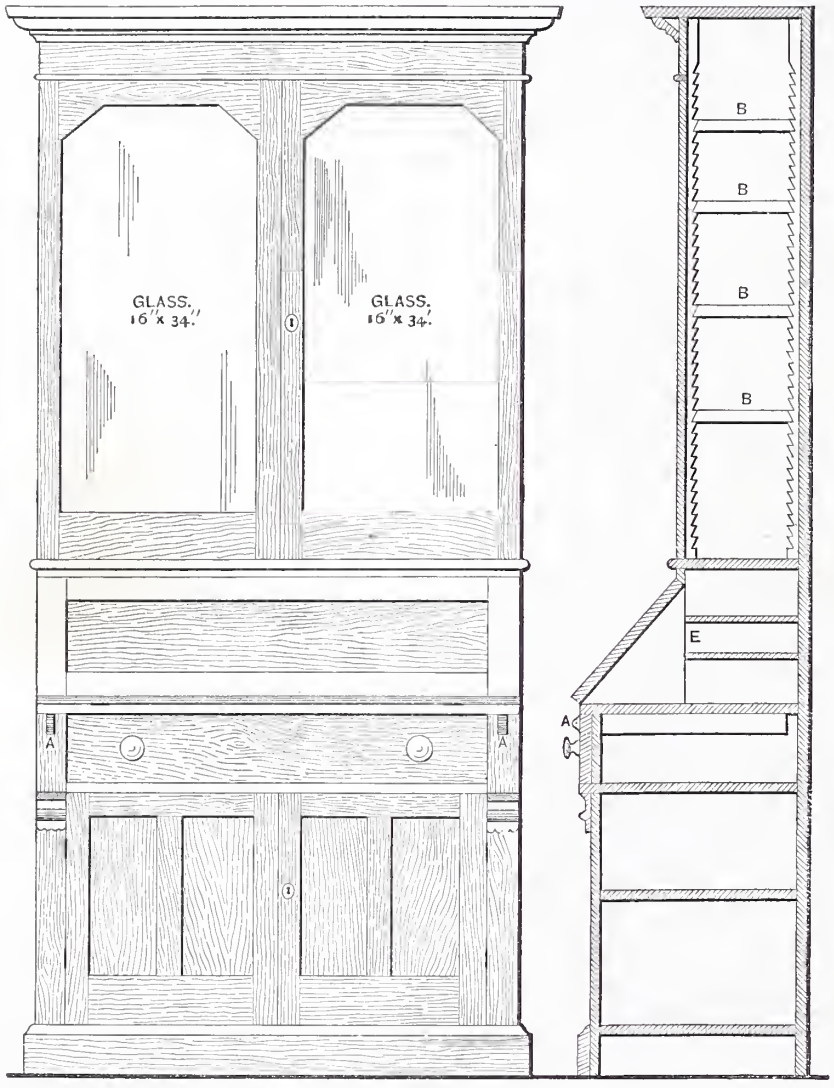
### Styles of Architecture —Clapboards.

*From* T. D. G., *Carson, Iowa.*—Will you be kind enough to illustrate through the columns of your journal the characteristics of the "Queen Anne," "Elizabethan" and "Eastlake" styles of architecture. Volume 1 of your journal treats the subject briefly, but I cannot distinguish the different styles from what I find there. What is the difference between what you term clapboards and what we call weatherboarding?

*Answer.*—The distinctive features of the ordinary styles of architecture mentioned by our correspondent are "something no fellow can find out." They cover such wide ranges of taste or fancy, and permit of such a variety of modifications to suit the taste of architect or owner, that it is quite impossible to say nowadays where one style begins and another ends. A great deal might be said on the subject by way of discussion, but we think it probable that before we had made the matter plain, so that our correspondent would know the styles of architecture without asking the architect which he meant it to be, they would all have gone out of fashion, and the inquiry would have lost its interest. At present they are rather names than styles, and as architects use them without any very clear idea of their meaning in a great many cases, any attempt at classification would, we fear, be misleading. Perhaps at some future time we shall give this matter more serious consideration. What we have intended in what we have said above is merely to indicate to our correspondent that at present architects are so much in the habit of calling an eccentric design by any name that it is likely to please the owner, that until something like a style has been developed out of all this confusion it will be difficult to discuss intelligently the meaning of the various names now in common use. As to clapboards and weatherboards, in some localities there is no difference; in others there is. The term clapboards applies strictly to siding put on in such a way that each board overlaps the one immediately below it. Weatherboarding may mean clapboards or any other kind of siding, but clapboards never mean anything other than what we have described.

### Design for Bookcase and Secretary.

*From* R. W., *Caledonia Station, Mich.*—In reply to the question proposed by G. W., of Marysville, Mo., in the September issue of *Carpentry and Building*, I send a sketch




*Design for a Bookcase and Secretary, Contributed by R. W.—Figs. 1 and 2.—Elevation and Section.*

of the bookcase and secretary that I made last winter for myself, and which I like very much. It stands 7 feet 4 inches high. The desk is sloping and is part paneled. It has hinges at the bottom that open and rest upon bars that are pulled out at A. Below that is a drawer, and below that again is a cupboard with paneled doors, two panels in each door. B is a vertical cross-section, and shows how it is made. C shows how the inside of the writing desk is constructed, and the lines E, in Fig. 2, show that the pigeon-holes are as deep as the bookcase. The drawing is, I think, sufficiently clear without further explanation, unless it be that at F, Fig. 2, is a small strip that is also nailed to the pigeon-holes, to hold it fast for the lid to be locked to.

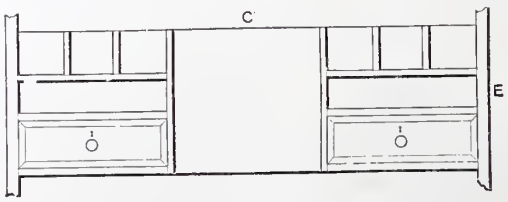



*Fig. 3.—Elevation of Drawers and Pigeon-Holes Shown in Section at E, Fig. 2.*

### Material for Plastering.

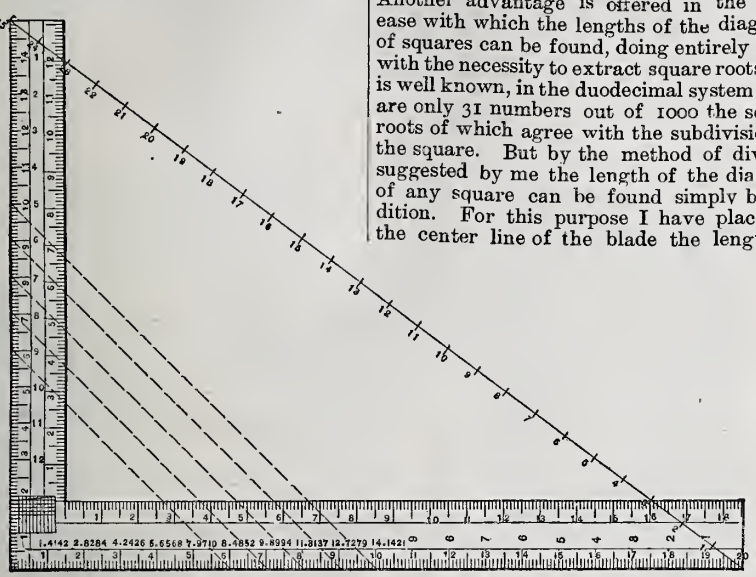
*From* C. P. N., *Marshall, Mo.*—A correspondent from Little Rock, Ark., in a recent number of the paper, says that he has found from experience that for 1000 yards of plastering it takes certain quantities of lime, lath, nails and plaster, based on the supposition that all is lathwork. In criticism of this statement I desire to say that it depends very much upon the quality of the materials used. With some kinds of lime it would not take as much as he represents, while in other cases more would be required. Some plasterers will use much less sand than he names. I have seen plastering where as much as 30 yards of sand were used to the 1000 yards of plastering. Lath, 15 to the yard, with ordinary openings, will hold out, provided the lath are of good quality. Further, if your correspondent means by his description that the plastering is to be hard finished, the plaster of Paris specified is not enough. I would say that as much as four barrels of plaster should be used on a surface of 1000 yards. The same holds good with brickwork. This, however depends somewhat on the quality of the sand used. If the sand be clean and sharp, and not too coarse, it will take the proportion I have named.

### Trussing a Weak Floor.

*From* J. W. A., *Peterboro, N. H.*—I would like to ask you a few questions, which perhaps may be of some interest to other subscribers of *Carpentry and Building*. There is a blacksmith-shop in this town which is causing some trouble to the owners, for the reason that it was never half built. It is 30 by 30 feet square, and two stories high, built of 2 x 4 inch stuff, balloon fashion. The corners are of 2 x 4 inch stuff, doubled with a 4 x 7 inch post in the center. The second floor is a very poor affair. The joists are 2 x 8 inches, 22 inches from center to center, 15 feet long, and bridged, resting at one end on ledge nailed to studding, and the other end gained into a 7 x 7 inch stick 30 feet long, which runs in the center of the building, and is framed into the above 4 x 7 inches. The trouble is that the floor has sagged, and springs so much that they are afraid it will come down. They asked my opinion about it and how to fix it. I told them I thought that if they would take out the old bridging, which does no good as it is, and put in some solid, and then put a truss-rod under the center of each span, it would help it. Am I right? But they thought that one truss-rod put under the 7 x 7 timber would do better. I should like to know whether I am right. I am more particularly desirous of information upon this point, as I have put in the rod under the 7 x 7 timber, but it does not help it much.

*Answer.*—It is quite clear that J. W. A. is right when he says that the second floor is a very poor affair, but it is not quite so clear from his letter how he proposes to remedy the evil. His suggestion to replace the herring-bone bridging by solid is not a good one. What does J. W. A. mean by "truss-rods under the center of each span? What spans? The fact of the matter is that the floor is bound to remain a rickety affair as long as it is tied to the balloon-frame by a ledge merely nailed to the 2 x 4 inch scantling. The floor joists being only 2 x 8, and 20 inches apart, will naturally result in a springy floor. These joists ought not to be more than 15 or 16 inches apart, and should

have two rows of bridging in each length. Whether the truss-rod under the 7 x 7 stick is to do any good depends on the load upon the floor, on the depth of the center strut and the size of the rod put in. These points must be known before the size of the rod can be decided upon. Mere guesswork will not do, even in so simple a construction. Diagonal cleats spiked to the under side of the joists, abutting against the 7 x 7 inch stick at the center, and tied into the corner-posts, together with a properly



*Improvement in Framing Squares Suggested by F. M. S.*

dimensioned truss-rod put under that stick, will probably solve our correspondent's difficulties in the simplest way. We shall be pleased to answer more fully J. W. A's questions if he will let us know what lumber he has available, what the hight of the lower floor is and what the second floor is used for, so as to get an idea of the weight upon it? Does the pitch of his roof admit of the floor being divided into four spans and suspended? The questions, while easily answered on the ground, must be more elaborated to be correctly answered by correspondence.

### Cheap Paint.

*From* C. S. K., *Waterford, Mass.*—Either you or I made a mistake in copying that receipt for a cheap paint noticed in the January issue. For the second coat it should read "more ground zinc and less whiting." I should also have said it is only suitable for buildings which have been painted with lead. It will not cover new work. Your theory may be very good, but experience is much better, for the paint I describe has been used for years, and is not to be compared to road dust and buttermilk. A painter at Raymond, N. H., has used it for years, painting houses and barns, and has lately employed it to paint quite a number of public buildings, including a church in Maine. As it is cheap, any one may satisfy himself as to its covering and wearing qualities.

*Note.*—We would remind our correspondent that crude experience is the most delusive thing in the world. The facts he cites prove nothing in favor of the cheap paint described by him in the January number of *Carpentry and Building* until they are considered in comparison with the cost and durability of a paint mixed with good linseed oil. The labor being about the same in both cases, we venture the assertion with great confidence that a properly compounded paint would be cheaper in the end.

### Improved Framing Square.

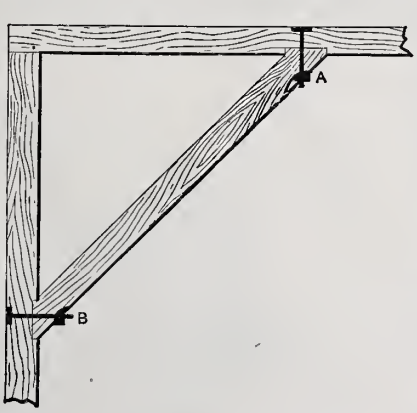
*From* F. M. S., *Hickory, Miss.*—I submit the subjoined method of dividing the framing square, as an improvement on the present method in use. As will be seen, I have adopted the decimal system for the subdivisions of the English foot, which is our unit of measure. I am satisfied that the adoption of the decimal system in our measurements—the foot being the unit—would prove as much superior to our present system as the application of the decimal system in our currency has proved superior to the English £ s. d. The advantages that would be gained by such a change are many. In the first place, all special scales for drawings of plans could be done away with; moreover, the legs of the square subdivided in this manner will give the natural tangents for any angle, thus saving considerable time and labor in the solution of triangles. Another advantage is offered in the great ease with which the lengths of the diagonals of squares can be found, doing entirely away with the necessity to extract square roots. As is well known, in the duodecimal system there are only 31 numbers out of 1000 the square roots of which agree with the subdivision on the square. But by the method of division suggested by me the length of the diagonal of any square can be found simply by addition. For this purpose I have placed in the center line of the blade the length of the diagonals of the squares whose sides correspond successively to 1, 2, 3, 4, &c., up to 10. If it is desired to find the diagonal of any square the side of which is greater than 10, we proceed by addition as follows: For instance, it is wanted to find the diagonal of the square the side of which is 25. From the blade over the figure 10 we read 14.1421, and over the figure 5 we find 7.0710; therefore, 25 being equal to 10 + 10 + 5, we have by addition

14.1421
14.1421
7.0710

35.3552 = the length of the diagonal sought. The saving of time and labor thus gained is certainly worth the trial of this method.

### Framing Corner Braces.

*From* W. A. Y., *Rice's Landing, Pa.*—I send you with this a drawing showing a




*Method of Framing Corner Braces Suggested by W. A. Y.*

method of framing corner braces which I consider an improvement upon a mortise and tenon. The braces are all gained in the posts and plates, or beams, from ½ to 1 inch, according to the size of the timbers, and are bolted through with ½ or ¾ inch bolts. The advantage of this kind of framing lies in the fact that it takes less time and is much stronger and better in every way. I have adopted it in a barn frame which I built this summer, and thus far it has proved satisfactory.

### Destruction of Property by Fire.

*From* L. C. B., *Roseville, N. J.*—It is stated that the value of property destroyed by fire every year amounts to $200,000,000. Are there any statistics of this subject, or is it purely guesswork, and is the guess anywhere near correct?

*Answer.*—The subject is one with which we are not very familiar, but it has statistics which are as nearly correct as may be for the civilized countries of the world. Probably the annual losses by fire would average about $350,000,000. The most trustworthy available statistics may be tabulated as follows:

| Countries. | Fire insurance premium.... | Rate of insurance..... | Ratio of pr'pty insured.—p.c. | National loss by fire..... | Do. per inhabited place... |
|---|---|---|---|---|---|
| U'd Kingd'm. | £6,900,000 | 0.25 | 46 | £9,100,000 | 61 |
| France..... | 3,760,000 | 0.10 | 75 | 3,200,000 | 20 |
| Germany.... | 6,530,000 | 0.21 | 74 | 6,100,000 | 32 |
| Russia..... | 900,000 | 0.50 | 9 | 21,000,000 | 60 |
| Belgium..... | 400,000 | 0.10 | 43 | 500,000 | 22 |
| Scandinavia. | 300,000 | 0.27 | 27 | 1,000,000 | 35 |
| United States | 11,600,000 | 0.90 | 15 | 22,500,000 | 105 |
| Canada..... | 1,550,000 | 1 10 | 30 | 4,100,000 | 230 |
| The World... | £31,910,000 | 0.27 | 43 | £67,500,000 | 59 |

These are English insurance statistics, which may be accepted with as much confidence as any statistics dealing with matters of which only a part of the truth is ever known.

### Animal Charcoal.

*From* B. & H., *Montreal, Canada.*—Can any of your readers inform us where blocks or bricks of animal charcoal can be obtained and how a filter of them can be constructed in a square brick cistern. I am informed such blocks are made and used for the purpose mentioned, but I cannot find out where they are made or how they are used or put together in such a way that they can be taken out and cleaned.

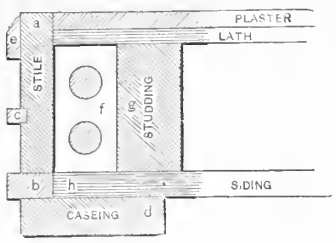
*Answer.*—Lister Brothers, of Newark, N. J., are manufacturers of animal charcoal bricks, and will undoubtedly furnish our correspondent with the desired information.

### Technical Schooling in New York.

*From* B. J. B., *Westerly, R. I.*—What chances are there in New York for poor mechanics to pursue a course in a technological school?

*Answer.*—New York City is tolerably well provided with a variety of technical schools, some of them open in the evening and others only available in the daytime. At Cooper Institute, which every American knows more or less about, various classes in science, technology and practical work open every fall and close in the spring. The tuition in all these, we believe, is gratuitous. Mr. Cooper's recent addition to the facilities of the Union enabled many branches of practical instruction to be introduced, and we believe at the present time a very good course in the mechanical branches can be obtained. In the trade schools of the Metropolitan Museum, and those under the superintendence of Mr. Achmuty, a great variety of branches are taught. Mr. Achmuty's schools take up the more practical trades, like plumbing, while the schools in the Metropolitan Museum of Art teach fresco painting, drafting, modeling in clay, designing of various kinds, coach drafting, &c. These schools charge a tuition fee of from $15 to $30 or $40, according to the branches taught. There is also a school for apprentices and others who are engaged in mechanical pursuits, in Fourteenth street. We may say, by way of parenthesis, that the applicants for most of the free schools are much more numerous than the accommodations for them, and only a small portion of those who apply can be admitted. The rule in all cases is "first come, first served." The Stevens Institute of Technology, at Hobo-

ken, N. J., gives a most complete course of practical engineering in all its branches. The tuition fee for persons residing in the State of New Jersey is $150 per year. The facilities for technical education in this vicinity may be said to be good, and yet much depends on what branches a young man wishes to pursue. Probably our friend could in many branches do quite as well by going to Worcester or Boston as by coming




*Construction of Box Window Frames.—Fig. 1.—Cross Section Through Frame, Arranged for a Frame Building.—Submitted by A. J. C.*

here. He would certainly be nearer home, and his expenses would be much less in all probability.

### Cowls Upon Soil and Vent Pipes.

*From* W. C., *Brooklyn.*—What is the best form of cowl to place upon the upper end of a soil or waste pipe.

*Answer.*—That all waste-pipes, soil-pipes and drains should be connected with the outside atmosphere all plumbers and sanitarians admit, but in what degree cowls assist the circulation of air through these pipes is a question about which much difference of opinion exists. Where the end of a soil-pipe rising above the roof is exposed to the chance of interference or injury, it is desirable to place a return bend or Emerson ventilator on the top, otherwise the end may preferably

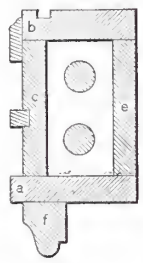


*Fig. 2.—Cross Section of Full Box Frame for Use in a Frame House.*

be left entirely open. Certain forms of caps or cowls which leave only a small opening for ventilation should not be used, as they are liable to be closed by rust or frost. During very cold weather the moisture of condensation from these pipes will often form icicles, and stalactites have been similarly formed from the dripping upon the roof under these pipes.

Mr. Hellyer concludes from many and careful experiments, that cowls should be

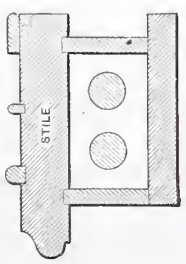
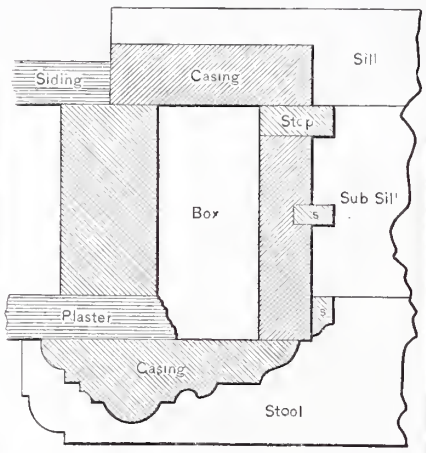



*Fig. 3.—Another Form of Construction.*

fixed on all ventilating pipes for foul air, not so much to assist the up-draft as to prevent a down-draft. Open pipes are found to work well enough in clear and light atmospheres, but in foggy and heavy atmospheres, or when raining, the cowl is thought necessary by some to prevent a down-draft. There are many forms of cowls which serve their purpose well if properly located. Put them in high positions and they draw accordingly, but put them under the roof projections, and their drafts will not break the atmospheric pressure upon any pipe. Hellyer advises to stick the cowl up high, not only for the four winds of heaven to blow upon it, but also to prevent any air coming out of it from entering the house through a window or chimney.

Mott's dome cowls for soil and vent pipes, if properly connected, ought to stand 1½ or 2 inches in the clear above the end of the pipe, and thus afford full exit for the foul air. As usually arranged, however, they have hardly any space between the cowl and the pipe, and this space is soon reduced by




*Box Window Frames.—Fig. 1.—Construction Submitted by H. & H. A Skeleton Box Frame.*

rust or closed entirely by frost. When even return bends are filled with ice and, as has been said, huge icicles formed at their openings, it is manifest that any form of closed cowl will be frozen tight. The ends of soil and vent pipes should be raised some distance above the roof of a house, so as to get a free sweep of air. It is common to find them set below the coping of roofs, beside chimneys or stuck away in corners. They need not be as high as a flag-staff—from 3 to 5 feet is sufficient—though some plumbers carry them up three times as high. They should be securely fastened at the roof. It is a reflection on good workmanship to be able to shake a soil-pipe at all, yet we have often found them quite loose within a few days

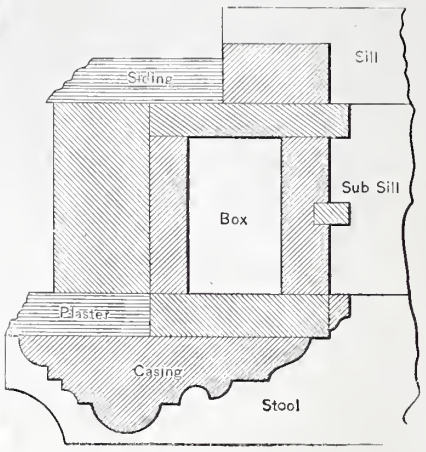



*Fig. 3.—A Full Box Frame.*

after being put up. If constructed in a proper manner this should never happen.

### Box Window Frames.

*From* A. J. C., *Pittsburgh, Pa.*—I have attempted to sketch the construction of box window frames in response to J. H. H., of Bel Green, Ala. Fig. 1 is the window stile, generally made of ⅞-inch stuff and sometimes 1¼-inch stuff. B is the outside guide, ⅞ by 1⅜, planted on the outside edge of stile before the casing is put on. C is the center guide, ½ by ¾ inch, with plow ¼ inch deep in the stile. D is the outside casing, 1 3-16ths inches by 4½ inches. E is the inside guide, ½ inch by 1 inch, 1¼ inches or 1½ inches, as the case may be. F is the space left between the window stile and

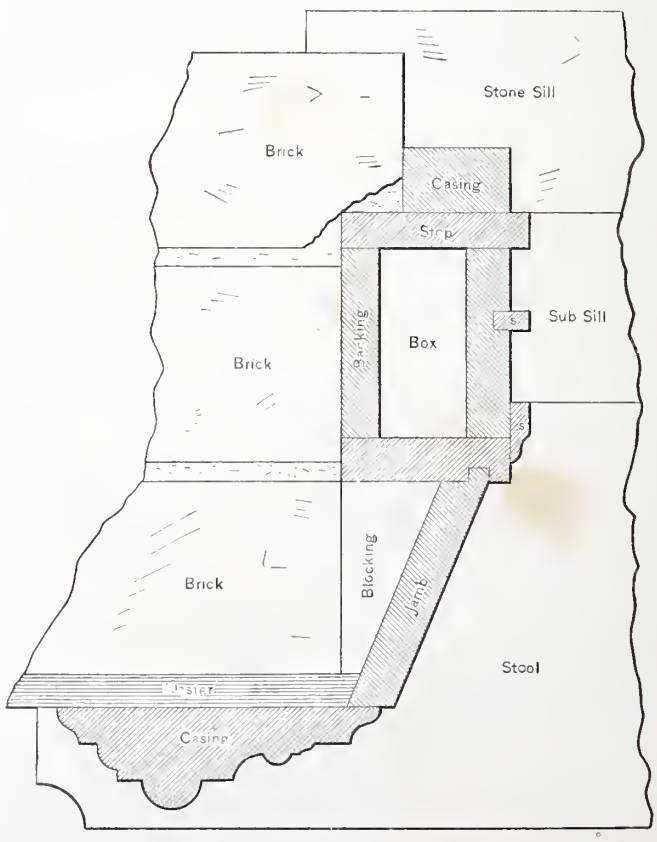
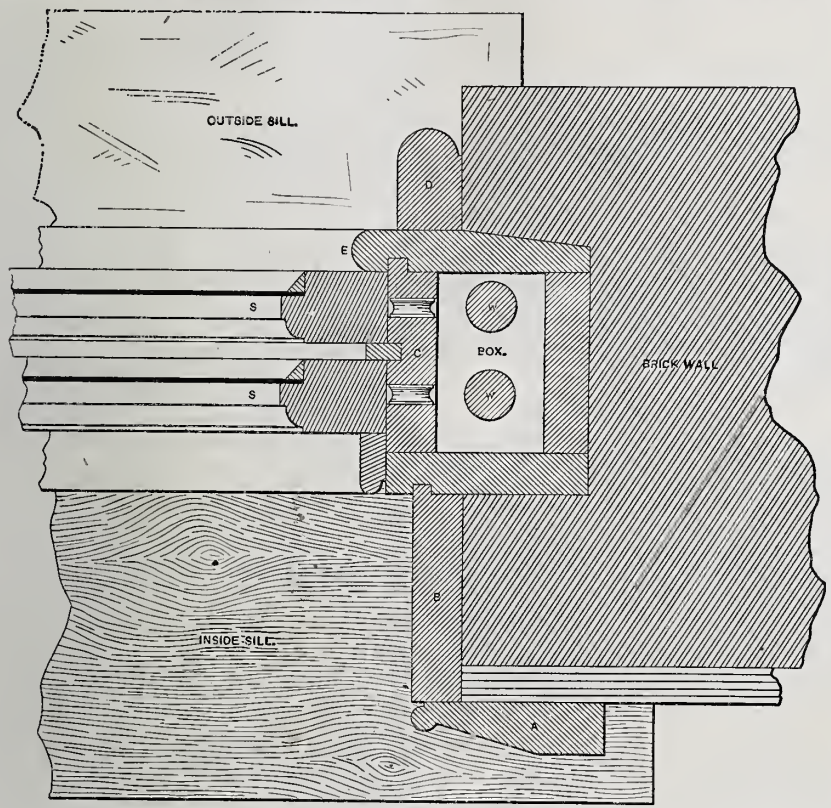



*Fig. 2.—A Box Frame of the Character Used in Brick Houses by H. & H.*

studding for weights. G is the studding set 2 inches from frame. H is the siding run over the studding to form part of the box. Fig. 2 is one style of box frames for brick buildings, made in four pieces of same thickness, usually ⅞ inch. A, the outside piece, is 4¾ inches wide; B, the inside, 4¼ inches

wide ; C, the hanging stile, has one groove plowed for the center guide. The O G mold is 1½ by 2½ inches, and is planted on after the frame is put together. Fig. 3 is another method of construction for the same purpose.

*From* H. & H., *Summitville, Ind.*—I inclose a sketch which I think will be of interest to the several correspondents who have asked about the construction of window frames. Fig. 1 is what we call in Hoosierdom a skeleton box frame, or rather a section through such a frame, showing the construction. This, as I understand the correspondents, is what is wanted. Fig. 3 shows a section through what is called a full box frame, as adapted for use in frame houses. Fig. 2 shows a box frame adapted for use in brick houses. The drawings so clearly explain themselves that no further particulars are necessary.




*Box Window Frames.—Fig. 1.—Diagram Submitted by T. H. S. for Frame in Brick Building.*

*From* T. H. S., *Wilmington, Del.*—I notice in a recent issue of *Carpentry and Building* an inquiry for a method of making a box-window frame. Inclosed I send drawings showing my method in brick and frame construction. Very little explanation is needed, as every part of the frame is lettered. One thing may be said in favor of tonguing the pulley style, which is very seldom done. It has a tendency to hold the frame square, which is often twisted in the settling of the wall, and which may cause the sash to bind. The other parts are as simply contrived as possible. In place of the nosing used on the face of the brick-wall frame, a 4-inch casing may be used if preferred.

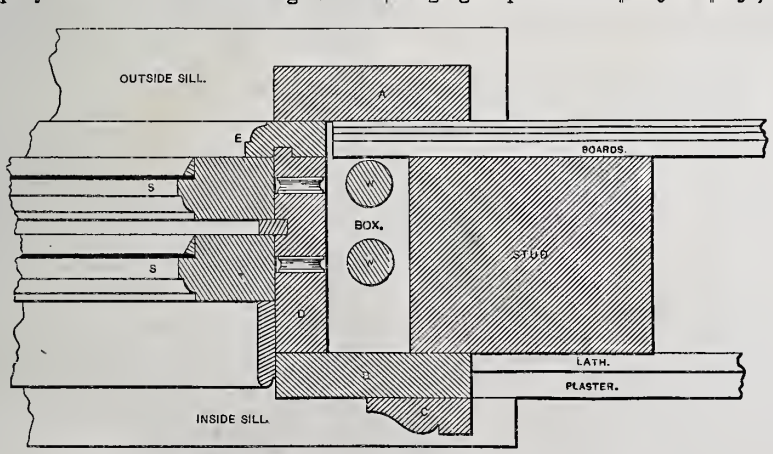



*Fig. 2.—T. H. S.'s Construction in Frame Buildings.*

**Electric Batteries and Generators.**

*From* E. N. H., *Columbus, Ga.*—Will you please publish in the columns of *Carpentry and Building* an illustrated article giving full particulars in regard to the subject of electricity? I should like to have information on this subject, from the smallest battery to the largest generator for the electric light. I should be pleased to have you give special attention to those machines which are more generally used and have the widest application, with sizes of batteries, method of construction, how managed, &c.

*Note.*—This would take considerably more space than even our ample columns could spare. Prescott's work on electricity, several recent works on electric batteries and many other books of a similar character, ranging in price from $1.25 to $1.50, cover the ground much more thoroughly than we could. One book is devoted entirely to the subject of batteries, and is as complete, possibly, as anything in the market. It is about as good a thing as a beginner could well have, but it treats of the battery only. There are little manuals, like Smith's and like Gore's work on electro-plating, which take up telegraphing, plating, &c., and give a pretty fair idea of each branch.

**Sliver Nailing.**

*From* J. M., *St. Paul, Minn.*—If G. L. F., of Milan, Ohio, will use a gouge for raising the sliver, he will find it will work better than any other tool. With a piece of hardwood rounded off on one corner, or with a hammer, press the sliver until it will stay in place. I do not think he would be wise in wetting the spot he wants to sliver, but I should like to hear the views of others on this subject.

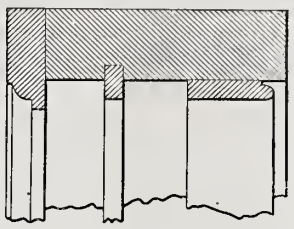


*Fig. 3.—Head for Frame Building.*

*From* J. R., *Grand Rapids, Mich.*—In answer to G. L. F., I would advise him to take a 5-16 chisel, draw the temper and bend it a trifle, so that he can keep it from going too deep. File the edge off square, then file the center of the chisel down to a cutting edge, also the edges to form lips. Then temper, and you will have a tool that will do the work required. I have seen a carver's gouge used, but the great objection was that they left the edges of the sliver too thin, and it was apt to warp if not perfectly glued. A sliver raised with my chisel has square edges, and when glued down it will fill the space perfectly. In raising a sliver, be careful not to go too deep, or the wood will break when it is raised to drive the nail. Use good but thick glue after nailing, and if you find any trouble keeping the sliver down, glue on a small piece of paper.

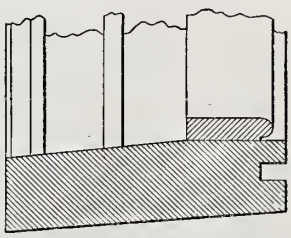


*Fig. 4.—Sill for Frame Building.*

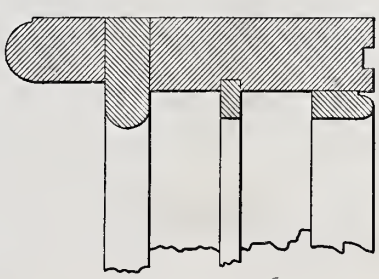


*Fig. 5.—Head for Brick Wall.*

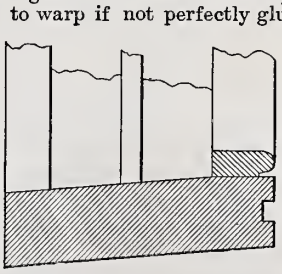
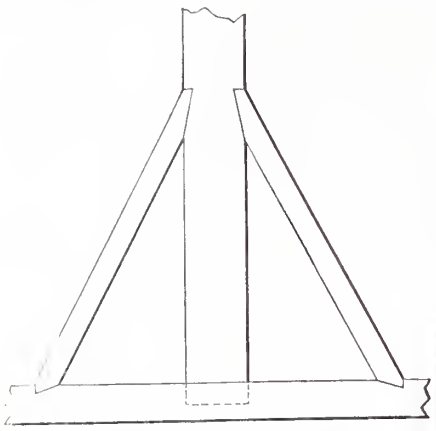


*Fig. 6.—Sill for Brick Wall.*

*From* G. H. C., *Minneapolis, Minn.*—I saw in the December number a request from

G. L. F., of Milan, Ohio, for information concerning sliver nailing. The way it is done in this city is to have a chisel made to order for the purpose. The tool should be ¼ inch wide with lipped edges similar to a plow-iron, only the lips should run up 1 inch from the end and be sharpened to a fine, thin edge. The shape of the chisel should be bent so as to keep the handle level and about 2 inches from the work. Care should be taken not to sever the sliver entirely from the wood, as it is difficult to glue it back in the place it came from. To keep the sliver down until the glue hardens, take the face of the hammer and commence at the roots of the sliver to rub it back into place. If the glue is in good shape it will only be necessary to hold the sliver down about 10 seconds with the hammer. In case the sliver breaks or will not rub down nicely, cover it



*Gate Posts.—Fig. 1.—Side View of Gate Post with Braces.*

with a piece of thick paper and when dry scrape off. The most important thing is to raise the sliver properly. I shall be glad to hear from other readers of the paper on this subject.

### Estimating Lath.

*From* J. R., *New York.*—Will you please explain the manner in which lath are estimated by plasterers in the construction of new buildings. Will you also be kind enough to name a book of practical value to a plasterer.

*Answer.*—Lathing and plastering are usually estimated by the square yard. Local customs govern the allowance to be made for openings, closets, &c. In some localities it is the custom to deduct all openings, such as windows and doors. In other places half of the openings are deducted, while the custom in still other sections of the country is to

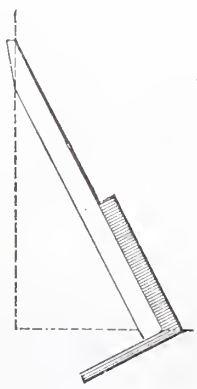


*Fig. 2.—Brace Cut with Square Heel.*

measure on all openings and figure them in. Closets, presses, &c., in one place would be figured at their actual surface contents, while in another section of the country the contents of the surfaces would be doubled. Perhaps, however, the information our correspondent desires is the number of lath required to lay a square yard. The calculation of this is very simple. A standard lath is 1½ inches wide by 4 feet long, and consequently contains one-half of a square foot. It would therefore take 18 lath to lay a square yard of surface if the lath were laid close together. As a rule, however, the lath fall sufficiently short in width to allow for the openings which are left between them. Each bundle should contain 500 feet, or 100

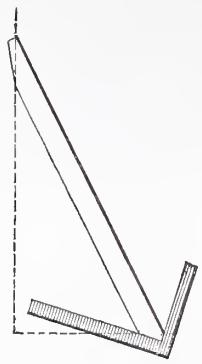


*Fig. 3.—Brace with Pointed Heel.*

lath. As some bundles fall short of this, and as there is more or less waste in cutting, it is necessary to make an allowance, and each lather has a rule for this resulting from his experience, which varies from 20 to 22 lath to the square yard.

### Framing Gate Posts.

*From* J. H. B., *Germantown, Pa.*—There are four subscribers to *Carpentry and Building* in the shop where I am working, and we differ as to the proper way of cutting the heel of the braces for gate-posts. In the accompanying sketches, Figs. 1 to 4, I have shown a side view of the gate-post and the three different ways in which the heel of the brace may be cut. By informing us through the columns of your paper which of these is the best, you will greatly oblige us.

*Answer.*—The manner of cutting the heel of the brace shown in Fig. 2, where the heel

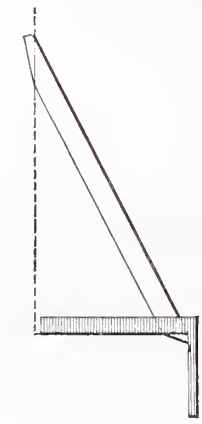


*Fig. 4.—Brace with Heel Squared to Sill.*

is cut square and at right angles to the center line of the brace, is unquestionably the best. Aside from the fact that it takes less work to frame the brace in this way, it brings the whole area of the brace section into play, and therefore gives greater strut-resistance to it than is obtained by either of the two other methods shown in Figs. 3 and 4.

### Size of Drains and Soil Pipe.

*From* Boss Plumber, *N. Y. City.*—What is your opinion in regard to the size of drain and soil pipes in ordinary dwellings? Are not the pipes we have been using too large, and is not the growing tendency to use smaller pipes perfectly rational?

*Answer.*—In Great Britain 6-inch soil-pipes were formerly common to receive the wastes from four or five water-closets. At present 5-inch and 4½-inch are the usual sizes, even for a single water-closet. Hellyer claims that the soil-pipes should be no larger than the outlet of the water-closet, and sarcastically says it is not wanted for a coal-shute or dust-shaft, but to be well flushed at every using. For a private house, where care would be shown in using fixtures, he thought a 3½-inch lead soil-pipe ample for a tier of three water closets, and a 4½-inch pipe for 12 water closets; the smaller pipe kept cleaner than one of larger size. Whether Mr. Hellyer would favor an iron soil-pipe of like size is not to be taken for granted, as he always assumes that lead is smoother and can be kept cleaner than cast iron. Hellyer refers to the architects and others who want good strong plumbing—using the best material, but requiring very large soil-pipes and drains. These are as common here as in Great Britain, and we have frequently come upon their work—huge 10-inch wrought-iron drains, with hubs as large as a barrel.

Colonel Waring's vigorous advocacy of small drains has converted most persons to admit their advantage. His experiments at Saratoga showed that the drainage of a large hotel, containing 2000 occupants, could be carried off in a 6-inch pipe. For an ordinary city dwelling a 4-inch drain is ample, even including the rainfall, while for a large house or a French flat a 6-inch pipe will suffice. The common objection to small drains is that they may get choked with articles thrown into them by careless servants—as scrubbing-brushes, towels, broken glasses, crockery, spoons, forks, &c., all of which have been found in them; but a 4-inch drain will carry off any article which can pass through a water-closet or sink trap, and hence it is quite large enough to meet that objection, so long as it is laid with a proper pitch, no angles, and is well flushed. The growing use of modern water-closets which discharge several gallons of water each time they are used, is an additional aid to keeping house drains clean and clear from obstructions. Small drains are more likely to be self-cleaning than large ones. A stream of sewage that fills the former completely will only cover the bottom of the latter, and, having less velocity, will exert less force upon the sediment and coating of filth which forms within all waste-pipes. Grease always fills up a large pipe sooner than a small one. We have a 5-inch drain taken from a very large house in Brooklyn, in which the water line shows plainly exactly along the center of the pipe. A pipe two-thirds as large would have served just as well. Colonel Waring now advocates reducing soil-pipes to 3 inches, but this change is yet to be demonstrated by experience.

### How Is the Inch Gained

*From* C. H. S., *New York.*—Will you please submit this letter to your many readers. It may be of some interest to some of them. Take a piece of paper 8 inches square, which is of course 64 square inches, and cut it as shown in the accompanying drawing. Then place the pieces as shown in Fig. 2. They will now form an oblong square 5 x 13 inches, which certainly contains 65 square inches. Now, will some of the readers of the paper please explain how the inch is gained?

*Answer.*—This problem was fully illustrated and discussed in *Carpentry and Building* for June, 1879, page 19.

### Constructing an Ellipse.

*From* J. P. F., *Chilton, Wis.*—I desire some information in regard to the construction of the ellipse. Can a perfect ellipse be made with compasses—that is, one that will stand the test of the trammel. You will confer a favor by publishing an answer to this question.

*Answer.*—A mathematically correct ellipse cannot be constructed with compasses. Our correspondent is referred to an article on this subject which appeared in the January number of *Carpentry and Building* for 1879.

### Lien Upon Public Building for Non-Payment of Wages.

*From* G. F. W., *Danville, Pa.*—Will some of the many readers of *Carpentry and Building* inform me whether a man can take a lien upon a public building or not? Suppose the party constructing the building hire me by the day to do work, can I take a lien on the building for non-payment of my wages?

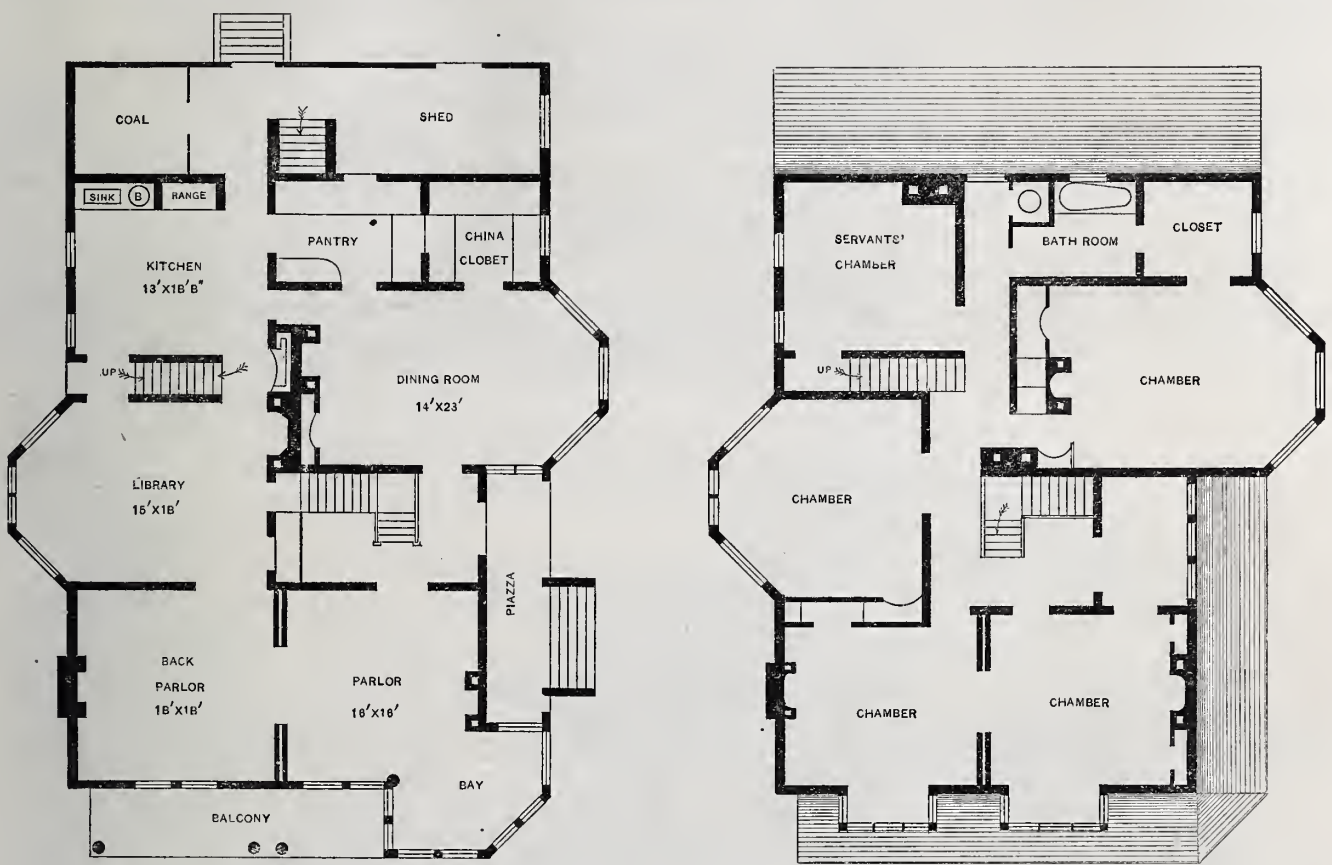
*Answer.*—The laws bearing upon me-

chanics' liens are different in the different States. We should advise our correspondent to seek the advice of counsel.

## REFERRED TO OUR READERS.

### A Woman's House Plans.

*From* L. S. H., *Middletown, N. Y.*—We have studied with great interest the many and varied house plans published for the past two years in *Carpentry and Building*, but they appear to us to be redundant in halls and stairways, outside chimneys and verandas; besides, most of them have only 8 rooms, while we are looking and planning for a house with 10 rooms. Mr. H and I are growing old, and soon it may be desirable to have our sleeping-room below stairs, on the sunny-side of the house, where we may rest and doze and dream of buried hopes and ambitions. We have taken one of the progressive studies in the December number of *Carpentry and Building*, and developed it into a house such as we would like to build—the study of a woman not learned in architectural law; hence we would like, should the plan meet with your approval, to have it published, and see if others may not also like it. In this case, some one might perhaps work up a perspective for the benefit of all concerned. Our purse will not admit of an expensive structure, but something neat and practical for a suburban village home. We like the style of the elevation and roof of the 8-room house in the August number of the paper for 1882, and it seems to us that it might be modified to the floor plans herewith submitted. The hight of the first story is to be 10 feet; of the second, 9½ feet. We wish the roof plates close down to the attic floor, and think a few windows in the roof desirable. We do not wish attic rooms, nor do we like the roof of the first-prize house. By the plans submitted we have a rear shed, so as to have our coal and wood on the same level with our work and living rooms. We have a Baltimore heater in the dining-room to heat the chamber and hall above. A heating range in the kitchen heats the bath-room and chamber overhead. The library is provided with Jackson's ventilating grate, while a wood fireplace graces our private room.

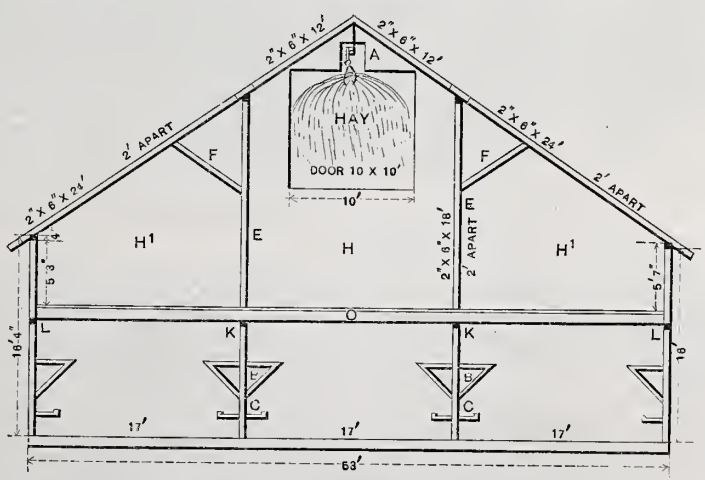



*A Woman's House Plans.—Floor Plans 1-16th Inch to the Foot.—Submitted by Mrs. L. S. H.*

### Barn Building.

*From* "BUFFALO LAKE," *Norway Co., Minn.*—For the first time I take the liberty of laying before your readers a matter which many in this Western country are concerned in. The accompanying sketch is a cross-section view of a barn 53 feet wide by 100 feet in length, built about 15 months ago in this vicinity, for the exclusive use of cattle. So far it has stood the everlasting prairie winds, and Minnessota's heavy snows have not had the least effect on its large roof. To day it stands as steady and secure as any barn of even smaller size in the country.

The floor of the barn is supported by joists 2 x 12 inches, placed 16 inches apart from K to K, and placed 20 inches apart from K to L. The joists rest on stringers 6 x 8 inches, which are 17 feet apart, and the stringers on posts 6 x 8 inches, 7 feet apart. There are no timbers above the floor heavier than 2 x 6 inches. This is considered a great advantage in this country; it is so difficult to handle heavy timbers where men are scarce. The studdings E are the objectionable feature about this building, as the entire loft is intended to be used only for hay, which is carried into the barn on a patent hay fork, thence on a track, A, which runs the entire length of the barn, from which the hay can be dropped at any point. The studding prevents the hay from going to the sides H. I would respectfully ask some of your many readers to suggest a plan that would do away with the studding without imparing the utility of the center portion marked H. If necessary, we could support the floor with posts and stringers at O. An addition of 60 feet or so will be made to this barn next summer. If any improvements are made on the accompanying sketch, they will certainly be due in great part to some of your many readers. I trust some of your practical barn builders will give this matter a little attention.




*Construction of Barns.—Diagram Accompanying Letter From "Buffalo Lake."*

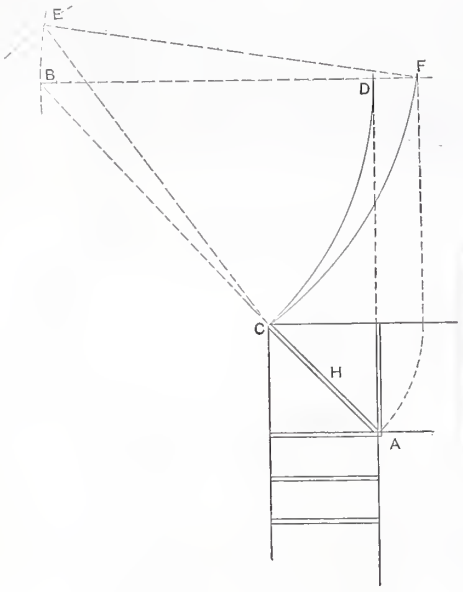
### Rafter Problem.

*From* H. E. G., *Plainfield, N. J.*—I notice that the correspondents of *Carpentry and Building* are busy with rafters again. I would like to ask the roof framers among the readers of the paper how they determine where the ridge of a pediment will strike the rafters of the main roof without the necessity of leveling the pediment ridge board when putting a rafter up. This question is based upon the supposition that the pediment is lower than the main roof, and of different pitch.

### Rafters for French Roofs.

*From* G. J. D., *Des Moines, Iowa.*—I submit a method for striking the rafters in a curved mansard roof. A represents the plan; C D is the minor rafter, and C F the major rafter, or the rafter shown in the plan by C A. I submit the method, clearly shown in the diagram, to the readers of *Carpentry and Building* for criticism, and shall be pleased to have it discussed.

*Note.*—We trust some of our geometrical readers will accept the invitatiou of this correspondent and give the method he presents such attention as its merits demand.




*Rafters for French Roofs.*

This question was discussed in one of our earlier volumes, but undoubtedly still possesses interest for a large circle of our readers.

## STRAY CHIPS.

CHIPPEWA FALLS, WIS., has in progress of erection a hospital building that is estimated to cost when completed, $10.000.

PLANS HAVE recently been completed for a new schoolhouse building at La Crosse, Wis., estimated to cost, when finished, $18,000.

A DETAILED STATEMENT of new building improvements in Bay City, Mich., for 1882, shows the expenditures to have reached $1,049,000.

THE CITIZENS of De Soto, Mo., are about putting up an edifice that will be known as the Masonic Building. It will be used as a City Hall, and will cost $20,000.

ACCORDING TO the Building Statistics, there were issued in the city of Topeka, Kan., during the 12 months just passed, 1146 building permits, which represent an expenditure of $1,101,222.

PEORIA, ILL., is to have a new Methodist church building that will cost $35 000. It will be situated at the corner of Sixth and Franklin streets. The plans have already been prepared.

MUSCATINE, IOWA, has been doing considerable in the building line during the year just closed. According to reports that reach us, the cost of the improvements was something like $230,000.

MESSRS. E. M. FISH & CO., of Eau Claire, Wis., were the architects who prepared the plans for the private residence of Mr. J. G. Thorp that is now in progress of erection in that place. The cost is in the neighborhood of $25,000.

WHAT IS undoubtedly one of the finest private residences in the Southern States was completed a short time since for Mr. Ross R. Winans, of Baltimore, Md. The structure is 75 x 66 feet and five stories in light. The cost was $500,000.

MESSRS. M. R. BALDWIN and Charles B. Peck are the owners of a handsome hotel building that is in progress of erection at Columbia, D. T. The structure is 60 x 80 feet and four stories in hight. It will furnish accommodations for about 150 persons

ACCORDING TO reports that reach us, Council Bluffs, Iowa, has made quite extensive improvements in the building line during the year ending January 1, 1883. It is claimed that $1,500,000 has been expended in this direction during the period named.

THE OLD First National Bank building, situated on the southwest corner of Washington and State streets, Chicago, Ill., is undergoing some important changes. The building permit was issued to Mr. William E. Hale. The cost of the improvements is $25,000.

MR. C. H. CHANDLER is the architect of a new City Hall and engine-house that is in progress of erection at Racine, Wis. The building is of brick, and will comprise City Hall, offices and engine-house. The estimated cost of the structure, when completed, is $35,000.

A GERMAN BAPTIST CHURCH BUILDING is in course of erection on the corner of Sixth and Walnut streets Milwaukee, Wis. It is 75 x 50 feet in dimensions, and will have a seating capacity of 500 people. It is expected to be ready for occupancy early in the spring.

AT BALTIMORE, MD., Mr. Frank, of the firm of Frank & Alder, of that city, is about putting up a residence on Eutaw Place that is estimated to cost $35,000. The building will be 103 x 25 feet in size, three stories, with mansard, in hight. The drawings were prepared by Mr. Charles L. Carson, architect.

MR. GEORGE A. FREDERICK, architect, has prepared the plans for a warehouse to be erected on the corner of Light and Balderston streets, Baltimore, Md. The structure will be 117 x 37 feet in size, and finished with brownstone and terra cotta. The cost is estimated at $50,000. Mr. Albert Gottschalk is the owner.

MESSRS. SEXTON & CO. are the owners of a large "flat" building that is now in course of construction, on the corner of Cass street and Chicago avenue, Chicago, Ill. The structure is 163 x 154 feet, and will have a high basement of Bedford stone and four stories of pressed brick. The estimated cost is $90,000.

THE NEW State Capitol building that is in progress of erection at Des Moines, Iowa, has thus far cost $2,000,000. The structure is 365 feet long from north to south, and measures 274 feet from the sidewalk to the top of the central dome. It is estimated that it will require $500,000 more to complete the building.

THE Evens & Howard Fire Brick Company, of St. Louis, Mo., have recently doubled the capacity of their works by erecting a three-story brick addition, 60 feet front by 200 feet deep. The fire-clay deposits that this company are working are particularly valuable, and the goods produced command a wide sale.

THE PLANS have just been prepared for a new church building, to be erected on the corner of Hermitage avenue and Jackson street, Chicago, Ill., for St. Jarlath's parish. The material used in its construction will be rock-faced Lemont limestone. The dimensions of the building are 136 x 55 feet, and the estimated cost is $40,000.

PLANS HAVE been completed for a stone block to be put up in Toledo, Ohio, in place of the burned Hall building. The structure will be 100 x 75 feet in dimensions, and three stories and basement in hight. The architects are Messrs. Palmer & Spinning, of Chicago, Ill., and the structure is estimated to cost, when completed, $100,000.

MR. W. H. LATHROP, of Racine, Wis., has recently put up a very handsome double store building. The structure is 80 x 60 feet in size and three stories in hight. Racine pressed brick, with Bedford stone trimmings, were used in its construction. The cost was $24,000. Messrs. Bothsford & Hockings were the contractors, and C. H. Chandler the architect.

THERE HAS LATELY been filed in the County Clerk's Office a certificate of incorporation of "The Bowling Green Building Company of the City of New York." The object of the company is said to be the erection of buildings in the city. The capital stock is fixed at $1,000,000. The gentlemen named as incorporators are Wm. Grenelle, John O. Stevens and Louis S. Phillips.

ACCORDING TO REPORTS that reach us, the year 1882 has been a prosperous one for Manistee, Mich. A large number of business blocks have been completed, substantial church and school improvements made, some 200 new dwellings erected, and from 1500 to 2000 people have been added to the population, making at the present time a population of from 11,000 to 12,000.

THE DIXON FIRE-CLAY COMPANY, of St. Louis, Mo., are erecting extensive works for the manufacture of pots for glass makers and hydraulic pressed building brick. For the latter product there is a demand far in excess of the supply in St. Louis. Building operations are frequently delayed and often completely interrupted, owing to the difficulty of procuring brick as fast as it is wanted, and the evil appears to increase every year.

SOME GENERAL idea of the amount of building that has been done in the city of Chicago, Ill., during the past year may be gained from an examination of the Statistics of Building recently completed. According to these, the number of permits issued during the year 1882 was 5640. The street frontage covered with new structures, lineal measure, was in the neighborhood of 14 miles, and the aggregate cost of the buildings put up was about $20,000,000.

MR. J. R. THURBER has in course of erection on Forty-seventh street between Eighth and Ninth avenues, New York City, a carriage repository, 90 x 50 feet in size and five stories in hight. The structure will be of Philadelphia face-brick, with Ohio stone finish. The plans were prepared by Mr. J. M. Dunn. The building will be occupied by Messrs. Brewster & Company. The cost is estimated at $35,000.

MESSRS. YOUNGS & CAMPBELL, architects, have prepared the plans for a handsome private residence for Mr. J. Rothschild, that is being put up on Fifty-seventh street, between Fifth and Sixth avenues, New York City. The building will be in the French Gothic style of architecture, 65 x 50 feet in plan, and constructed of Bedford stone richly carved. The estimated cost is in the neighborhood of $250,000.

IT IS PROPOSED by Prof. C. K. Adams and several of his friends to secure a peal of bells to be hung in one of the towers of the State library building at Ann Arbor, Mich. The contract for the bells has been awarded to the Meneely Foundry, of Troy, N. Y., and they are to be ready for shipment early this month. The bells will be five in number, weighing 3000 pounds, 1500 pounds, 850 pounds, 500 pounds and 325 pounds respectively.

IT IS REPORTED that the past season has been a prosperous one in the building line at Winnepeg, Manitoba, a large number of structures having been erected, some costing as high as $150,000. Philadelphia pressed brick was employed to a considerable extent in the construction of many of the buildings. The wages of carpenters range from $3 to $4 per day, and bricklayers from $4 to $7. It is stated that work is progressing on the City Hall building and Opera House.

AMONG THE buildings put up during the month of December in Denver, Col., were a two-story brick dwelling, 41 x 40 feet in size, for Mr. W. I. Fay, costing $5000; a brick church for the Thirteenth avenue Presbyterians, 67 x 60 feet in dimensions, and costing $18,000; and a double two-story brick dwelling, 55 x 42 feet in plan, and costing $8000, for Mr. C. J. Clark. Messrs. Hallock & Howard were the builders of the church, and Messrs. McCain & Johnson of the double dwelling.

A CORRESPONDENT from Wilksbarre, Pa., writes us that building operations in the Wyoming Valley are brisk, and the prospects for the immediate future encouraging. As an indication of the condition of the building business during the past 15 months, he states that during that period he has put up 144 houses. The Lehigh Valley and North and West Branch Railroad Company have laid the foundation of a large union depot building at the corner of Canal and Market streets in that town.

DURING THE YEAR 1882 there were issued in Denver, Col., permits for buildings aggregating in cost some $2,886,011. Including the work done on the Opera House, County Court House, City Hall, smelting works and Exposition Building, together with the cost of erecting some 500 structures put up in the suburbs, for which no permits were granted, the amount foots up to $3,811,071. This is an excess over the amount expended the year previous of $660,340, which shows that the season has been a busy one for that section of the country.

A PLAN HAS been filed in the Bureau of Buildings by the Mutual Life Insurance Company of New York City, for a structure to be put up on the site of the old post office, on Nassau street, between Liberty and Cedar streets. The building will have a frontage of 184 feet 8 inches on Nassau street, and a depth of 115 feet 9 inches on Liberty street and 111 feet on Cedar street. It will be nine stories in hight, with a front of granite and freestone. The structure will be used for office purposes, and is estimated to cost, when completed, $1,000,000.

THE PEDIMENT which crowns the central façade of the new Custom House, at St. Louis, Mo., is appropriately adorned with sculpture in the shape of two reclining figures, heroic in size. As seen from below, the statuary is well carved and the attitude graceful, with one exception. The elbow on which one of the figures seems to lean had no visible support but the unsubstantial air until some tender-hearted person placed a block of pine wood under it. By some miscalculation, either this elbow was modeled a foot too high or the granite pediment that was to support it a foot too low.

A BRIEF REVIEW of the building operations in St. Louis, Mo., for 1882, shows that the year has been to some extent remarkable on account of the number, variety and costliness of the new structures that have been put up. It is estimated that the total value of all the improvements of this character that were projected is $5,385,012.50, or nearly $1,000,000 in excess of last year. During the past 12 months there have been issued 2631 building permits, of which only 715 were for frame structures. Among the more important edifices erected were the Belcher Sugar Refinery, the Olympic Theater, the new college of the Christian Brothers, the Gay Building and the Lighton Building, the combined cost of which was upward of $1,000,000.

THE NEW Board of Trade Building in Chicago, Ill., work upon which was commenced in August last, will be one of the finest edifices in that city. The building has a frontage of 173 feet on Jackson street and 225 feet each on Sherman and Pacific avenues, and will be nine stories in hight. The style of architecture is modern Gothic. The portion set apart to the Board of Trade proper is 173 x 140 feet. The material used in the construction is Fox Island granite. The outside walls will be surrounded with large full columns placed between the windows. The most important of these columns will be made of wrought iron, of 3-inch metal, and will measure 80 feet in length x 42 inches in thickness. They will rest on finished bases of marble, and will largely support the upper stories of the building. In the center of the main, or Jackson-street, front is a grand tower having a width on the street of 32 feet. For 225 feet it will be of stone and brick, and the upper 75 feet of iron. All the floor and roof construction will be of iron, thoroughly fire-proof. No wood will be used in the building, except in the floor surfaces, window-work and doors. The heating will be by direct and indirect radiation from steam pipes. The foul air will be taken out both at the floor and at the ceiling, and conducted under the floors to a main ventilating shaft, within which will be built the main steam and smoke stack, the whole standing 185 feet high. The floor of the main hall is 18 feet above the sidewalk. The portion of the building devoted to the Board of Trade proper is estimated to cost $1,500,000. The office building in the rear will be nine stories in hight, and will cost another $1,000,000. The architect of the whole structure is Mr. W. W. Boyington.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=MARCH, 1883. NUMBER 3.

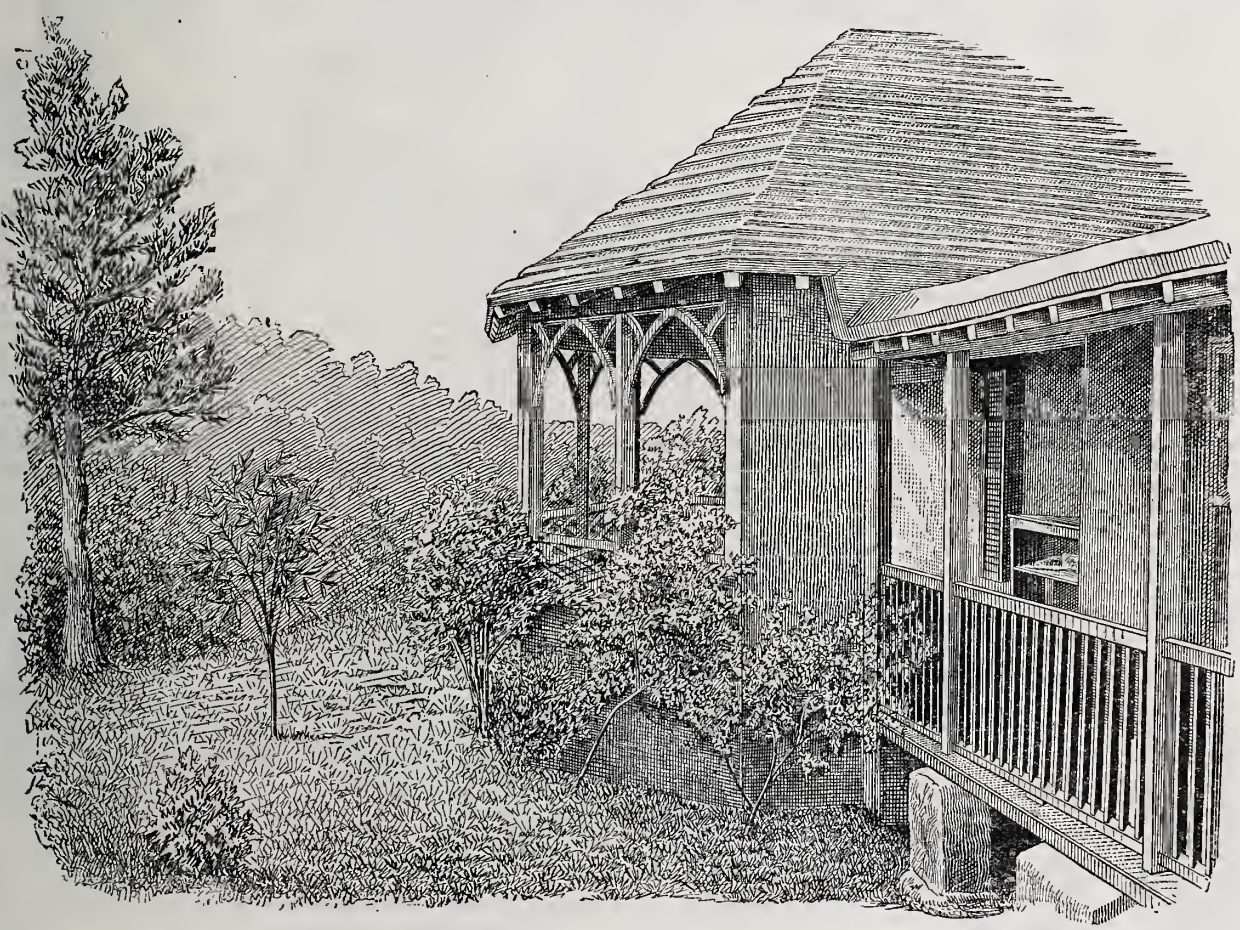
## House Building in Bermuda.

BY A. O. KITTREDGE.

A common desire of all persons of intelligence is to know how others do the same things as those upon which they are engaged. It is this demand for information—or spirit of curiosity, if such it be called—that gives zest to travel and lends interest to those accounts, whether illustrated or otherwise, which are among the prominent characteristics of modern journalism. The press abounds with descriptions of how this or that is performed in some section or other of the world; how various customs appear when viewed from a traveler's standpoint, and how things generally differ in the several countries of the globe. The builder shares this feeling, and besides being a dilligent reader of books and papers, frequently becomes a tourist and most assiduously devotes himself to a search for strange things pertaining to his chosen avocation. During the past winter we spent a short time in Bermuda and became very much interested in the building construction peculiar to a people who, in a certain degree, are cut off from other portions of the civilized globe, and who are possessed of a building material of unusual qualities. The climate of Bermuda, too, is peculiar, being very damp, with the thermometer ranging from 54° to 90° as extreme limits, while the necessities of the people and their habits and traditions each has its own influence in fashioning the dwellings of the inhabitants of this little island of the ocean. We shall attempt to describe some of the things we saw during our stay, in the belief that the account will be of general interest.

Much has been written concerning Bermuda, its semi-tropical character and the great advantages that it possesses as a winter resort, but no one, so far as we know, has ever given attention to its architecture and its building construction. From newspaper accounts one would anticipate in Bermuda striking tropical features. In this most tourists are disappointed, for the first appearance of the island as the steamer approaches is quite contrary to his preconceived notions. A succession of hills, some of them bleak in appearance and others covered by dark green foliage, the nature of which he does not clearly perceive until very close at hand, are quite the opposite of an ideal tropical island. One of the first things that attracts attention is the appearance of the buildings. Long before the traveler can make out exactly what they are, white patches on the hilltops, along the sides of the hills and in the valleys appear, which, under other circumstances, he might take for huge snow-drifts, the remnants of a rapid thaw. When examined through a glass or after the steamer has approached nearer to the shore, they prove to be houses of almost dazzling whiteness. Roofs, walls, doorsteps, paths leading through the yard, and the fences, are all of one common character and all as white as the driven snow. As the steamer enters Hamilton Harbor and gives opportunity for viewing the town as it appears from the water front, the same general characteristics in its buildings are noticed, save that more or less color is seen in the walls and about the trimmings, such as porches and the like; but the roofs remain the same. If a light fall of snow covered all the buildings the appearance of the roofs would scarcely be changed. The construction and materials resulting in such peculiarities at once commanded our attention.

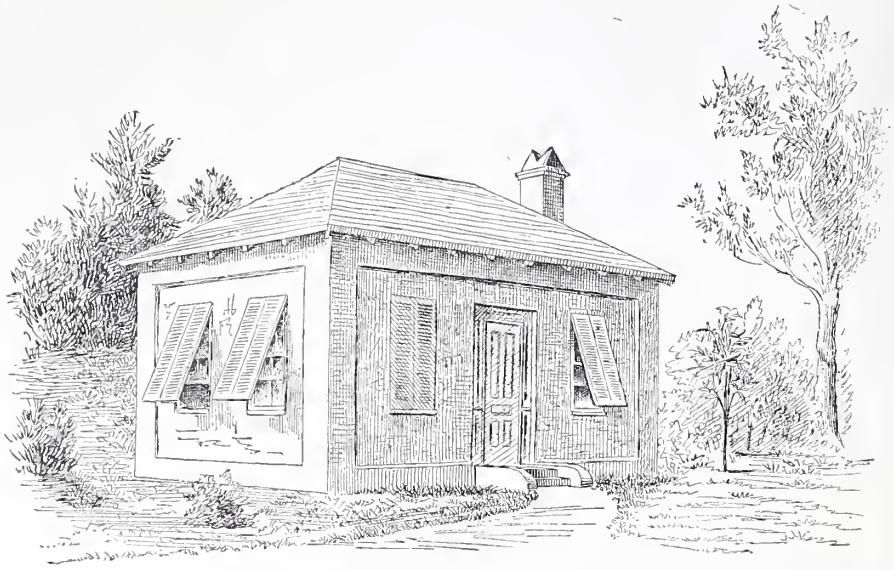
The formation of Bermuda is chiefly calcareous, consisting of the spoils of coral insects. Almost the entire island is of a white, shelly sandstone, very porous, and but slightly covered with soil. This stone, which in some respects resembles porous terra-cotta and like productions used in fireproofing buildings in our large cities, is the chief building material of the island. It is used in ways and for purposes that would hardly be suspected upon examination of a specimen. Walking out one morning soon after our arrival, we found a man working at a huge block of the stone with ordinary wood-cutting tools. He had a large cross-cut saw, less one of the handles, an ordinary hand-saw and a number of chisels with long handles, one of them in particular being some 12 or 15 feet in length. Approaching him we asked him whether he was a carpenter or a stone mason. He looked puzzled at our question and declared that he was neither—only a quarryman. We explained that we asked the question because, on account of the tools he was using, it would appear that he was a wood-worker, while judging by the material on which he was engaged and the forms that he was producing, he might be considered a mason. The manner of getting out stone for building pur-



HOUSE BUILDING IN BERMUDA.—A CHARACTERISTIC GARDEN FRONT.

poses is here indicated. The surface of a hillside is cleaned off, so far as the soil is concerned, and then cuttings are made from a convenient level directly into the hill. By means of the long-handled chisels we have mentioned, an incision is made vertically, either 2 or 4 feet back of the face of the cutting, to the depth the quarry is being worked; then with one or the other of the saws, depending upon the length of cut to be made, the block is sawn vertically from the front to the chisel kerf already made. The result is a block of sandstone 2 x 4 feet or 4 x 4 feet in size, and from 10 to 15 feet in hight, cut away from the surrounding hillside. It is then undermined by digging into one side of it, for which purpose an ax is sometimes employed, or more frequently an ordinary pick or mattock. When it has fallen over on its side it is reduced to smaller blocks by means of the saws already mentioned. From this it will be seen that our inquiry as to whether the quarryman was a carpenter or stonemason was not unreasonable.

The stone is sawn into blocks of certain standard sizes; 24 inches is the regular length and 6 inches the regular thickness. The width varies from 12 inches down to 6, according to the kind of wall that is to be built; 24 x 12 x 6, 24 x 10 x 6 and 24 x 8 x 6 are common sizes. The stone is so soft that a block may be readily defaced by the thumb nail. A lead-pencil point was not broken in driving the pencil into a block to a depth of ¾ inch. A light cane used as a dart and propelled with the ferrule end forward could, with a dextrous throw, be made to stick into one of these blocks of stone almost as though it were a piece of clay. The stone is so soft that no difficulty at all is experienced in breaking off a corner with the thumb and finger. A small piece which we carried to our room soon after we reached Bermuda and which we kept laying upon the bureau, served a good purpose as a pin cushion during our stay on the island. To drop a block of this stone from a considerable elevation upon a hard surface would leave scarcely more than a mass of sand. When seasoned, however, it becomes stronger in texture, but it scarcely ever attains the hardness of a soft-burned brick. The stone is remarkably light, although very wet when taken from the quarry. The weight of a cubic foot when first cut is only about 90 pounds. When allowed to season for a few months by being piled in the open air, the weight is reduced to less than 80 pounds per cubic foot. This material, strange as it may seem, forms the foundation, the outer walls, the partition walls, the walks leading to the houses, the fences and the roofs, of all Bermuda houses. Its durability for building purposes is beyond question. We saw houses that had been in use for 150 years that looked as though they might endure for another century.

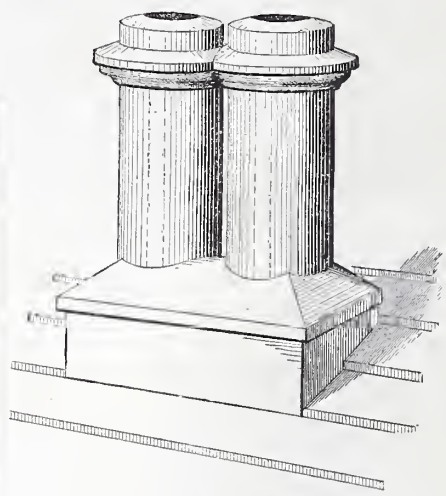


*House Building in Bermuda.—A Typical Cottage.*

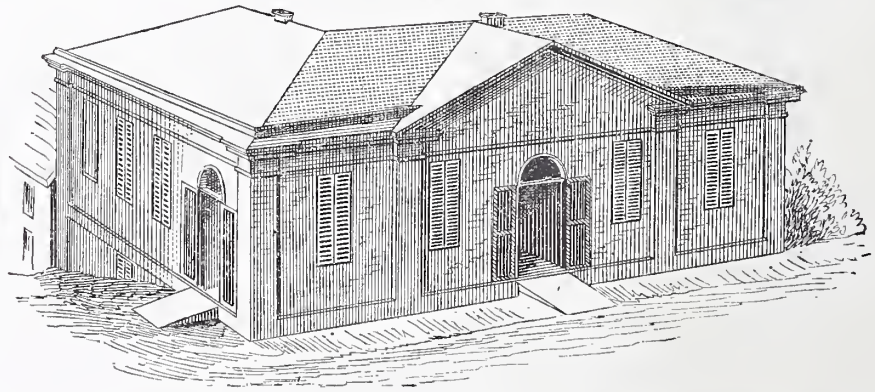
*An Old House Near the Flats Bridge, Bermuda.*

Before describing construction in detail we will mention the building wood of the island. The dark green verdure covering the hills, and which, as we have stated, has anything but a tropical appearance when viewed from the deck of an approaching steamer, is that of red cedar, which is the only building timber Bermuda has. The cedar trees do not grow very large. In the valleys they occasionally attain to 12 or 15 inches diameter at the base. Sometimes logs are taken out of swamps where they have lain, no one knows how long, of a still larger size. The timber is becoming scarce, large inroads having been made upon the supply, which in part accounts for the absence of large trees. We learned that cedar in the log is worth something like $60 per 1000 feet, while cedar lumber of the best quality brings $120 per 1000 feet. This, by the way, is not by any means clear stuff. It has more knots to the square foot than the worst specimens of pine culls. However, the knots have the good habit of remaining fast in their places, so that their presence is not considered a blemish.

The appearance of a typical Bermuda cottage can be gained from an examination of the first engraving on this page. Such buildings dot the island in all directions. The walls are laid up of the stone we have described. The rafters are of cedar, and the lath for carrying the "slate" are also of cedar. The roof covering is composed of thin slabs of stone laid upon the lath and fastened together slightly by mortar, but not nailed or otherwise attached to the roof framing. A fair article of lime is obtained by burning the fragments of stone made in getting out the blocks for a building, and by coating the surface of the roof with whitewash made from this lime it is rendered waterproof. Instead of whitewashing the outer walls of a house, however, which was formerly the rule, they are at present covered with a light coating of cement. It was formerly the practice to fur the building on the inside and to finish with lath and plaster. Latterly, however, great care is taken in cementing the outside, and protected in this manner they are now plastered directly to the stone, with satisfactory results.



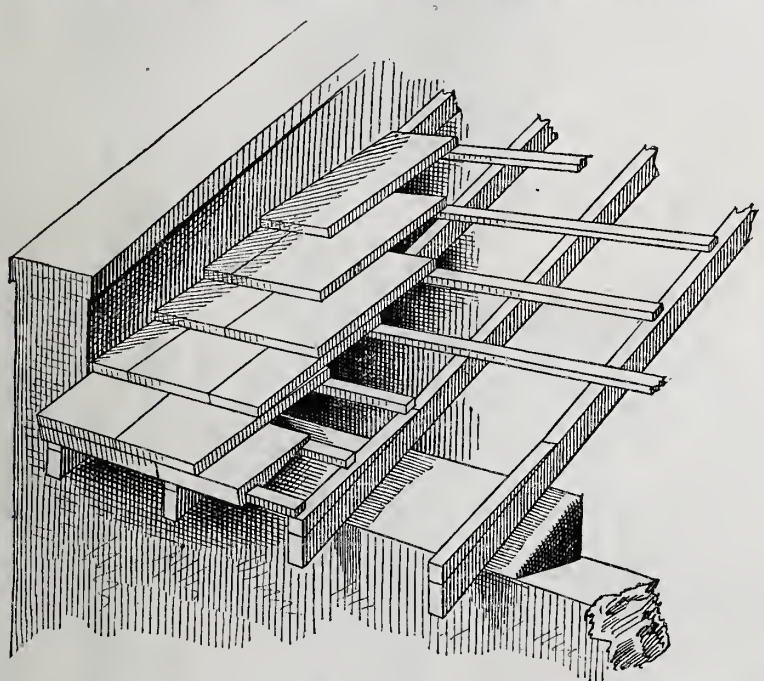
*A Group of Chimneys in Cedar Avenue, Hamilton, Bermuda.*



*Building at the Foot of Burnaby Street, Hamilton, Bermuda, Showing Common Arrangement of Gutters.*

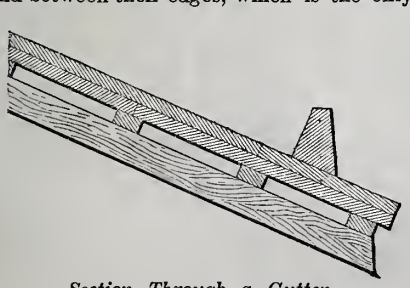
With stone so easily worked as that we have described, it does not seem strange that various fantastic shapes should occasionally be indulged in by the builders. Chimneys and gate-posts exhibit more eccentricities of this character than almost any other two parts of construction that can be named. No better opportunities for display of individual taste in design and skill in construction exist in Bermuda architecture. We might have sketched a variety of chimneys, but lack of space would probably have prohibited their presentation had we done so. We, however, show a pair from a house on Cedar avenue, Hamilton, which may be regarded as a characteristic example. The two chimneys stand so close together as to cause the molding at

the top to miter. They are cylindrical in form, and the flues through them are also round. A single base supports the two. As they stand upon the building they look as though they were the overgrown *fac similes* of the corresponding parts of a child's toy house. In the second illustration opposite we show a roof, coping and chimneys from an old house in the center of the island that is also an example of work of this character. The builders departed from the usual straight lines and indulged in a little of the ornamental. The coping was first cut to shape, then coated with whitewash, making the whole present an appearance as though carved out of a single piece.



*House Building in Bermuda.—General Plan of Laying a "Shingled" Roof.*

The slate that Bermudians use for covering their roofs are slabs of the same stone we have been describing, 12 x 18 inches in size and 1 inch thick. These are laid in one of two general ways, illustrations of which appear on this page. In the first they are "shingled on," being laid very much as ordinary shingles. In the other, two courses are also employed in forming the roof, but they are laid flat, or end to end, with joints broken both ways. The cottage illustrated on our first page shows a roof of the former description, while the building at the foot of Burnaby street, on the following page, shows one of the latter character. In laying the shingled roof, a course of "eave-stone" 2 inches thick at the base, and tapering to 1 inch at the top and notched to fit over the first lath, is employed. A rafter foot, so called, is employed at the eaves in supporting the lath of roofs covered in this way, in order to give the slates a "settle," thus relieving the lower lath from some of the weight. This construction is illustrated by the first engraving on this page. As the slates are laid a little mortar is used under them and between their edges, which is the only means of fastening. The same course is pursued in laying flat roofing, shown in the other engraving. After all is done, repeated coats of whitewash are applied, giving the roof that remarkable white appearance to which we have already alluded, and which Mark Twain compares to frosting on a cake. The gutter construction employed in Bermuda roofs is not the least peculiar feature about them. Pieces of stone cut to proper shape for the purpose are set up on edge near the eaves of the roof, thus stopping the rain-water in its course. By making the distance from the eaves to the gutter a little greater at one end of the building than at the other the necessary fall is given. Copious applications of whitewash are all that is necessary to make the gutters tight. A general view of a gutter made in this way is shown in the roof of a building at the foot of Burnaby street, Hamilton, which is illustrated herewith, while a section of gutter construction is shown among our sketches.



*Section Through a Gutter.*

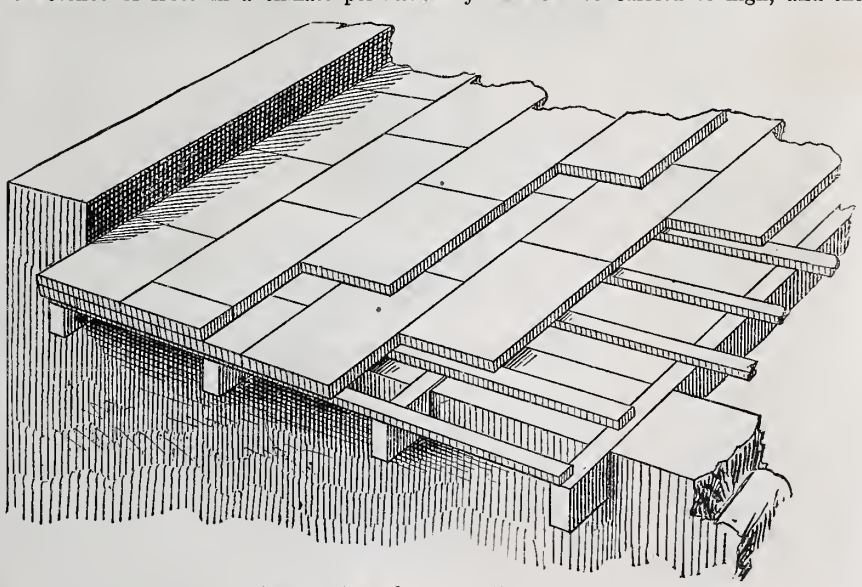
A further illustration of a gutter of this kind is shown in the engraving at the bottom of the first column opposite. Another peculiarity of this illustration is that it shows how water is sometimes carried across the end of the house. A channel with proper fall is cut in projecting blocks of stone left for the purpose, and is whitewashed as already described. The absence of frost in a climate permits construction which would never be dreamed of by those who are accustomed to winter seasons. Think of flashing a chimney by sopping whitewash around it!

Bermuda's sole source of fresh-water supply is the rain from heaven. Accordingly the necessity of keeping roofs clean and of carefully husbanding the water that runs from them is apparent to all. Cisterns for keeping the water are dug in the rock of which the entire island is composed, and are finished by cementing. The water is conducted from the houses by gutters made of this same porous material rendered waterproof by whitewashing.

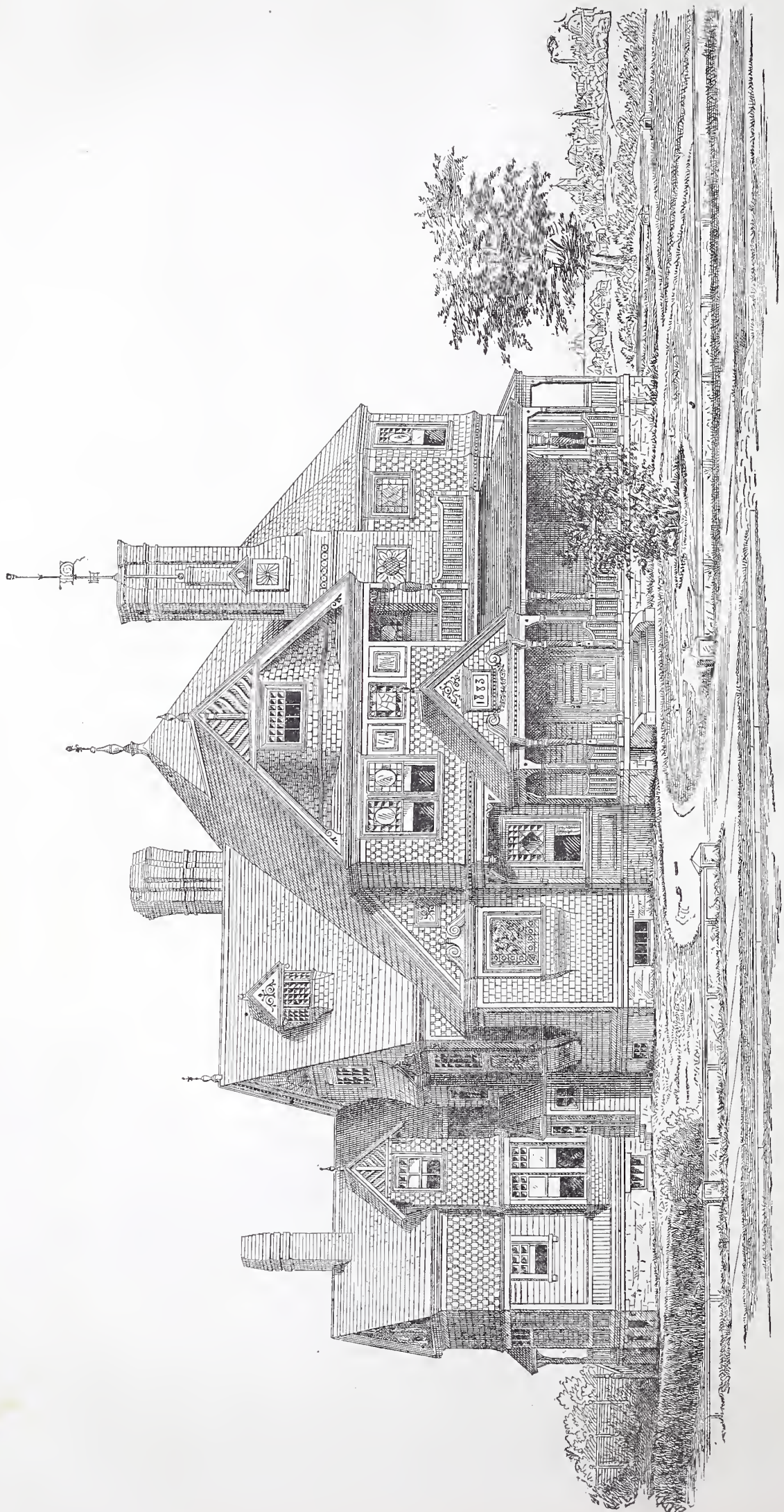
We have purposely limited our description to typical Bermuda houses. Buildings of a better class exist where variations are to be found, which, however, for the most part consist of the employment of the same material we have described, with a little more engineering skill than the native builders display. Many Americans are erecting residences in the island, and wealthy Bermudians are emulating the examples thus placed before them, and are acquiring buildings which, for completeness and comfort, leave very little to be desired. The house put at the disposal of the Princess Louise upon her arrival at the island recently is one of the latter class, yet built throughout of the peculiar material we have described.

A striking characteristic of Bermuda houses is the way in which the shutters are hung, an example of which is presented in the first engraving on opposite page. The patent hangers that are elsewhere illustrated in this issue are not employed, although they might be used to advantage. Were Bermudians an enterprising people, it would undoubtedly be a good stroke of business policy to present her builders with specimens of these fixtures, from which the advantage of this mode of hanging shutters could be learned. They are, however, quite conservative in matters of this kind, and probably would think the old way good enough, which is as follows: The upper end-piece of the framing of the shutter, which is made in a single piece for each window, projects at each side and forms pivots, one of which slips into a hole bored in a bracket nailed to the side of the frame. The other drops into a socket cut in a corresponding bracket on the opposite side. This allows the blind to swing from the top, and also permits it to be taken down whenever necessary. A screw-eye or staple in the center of the shutter at the bottom, with a rod 3 or 4 feet long fastened by a corresponding staple or set over a pin in the sill to hook into the staple, is the means employed for holding it open.

We did not succeed in ascertaining the crushing strength of Bermuda building stone. It is greater than would be supposed, however, from the fact that three or four story buildings are occasionally built out of it. However, this statement is too strong if we leave it without qualification. The unusual lightness of the material itself is one reason why walls can be carried so high, and the fact that buildings in Bermuda are seldom heavily loaded on their floors would make it possible to employ this stone, where otherwise it would be entirely unfit for use. In three-story houses the walls are started 20 inches thick at the base. At the top of the first story they are reduced to 16 inches, and then to 12 or 10 inches, as the case may be, through the third story. Partition walls are very commonly made of 8-inch stone. Ordinary houses are built throughout of 12's and 10's.



*Construction of a Flat Laid Roof.*




A STUDY IN SUBURBAN ARCHITECTURE.—PERSPECTIVE VIEW OF THE HOUSE FROM THE NORTHWEST.

## A Study in Suburban Architecture.*

BY AN ARCHITECT.

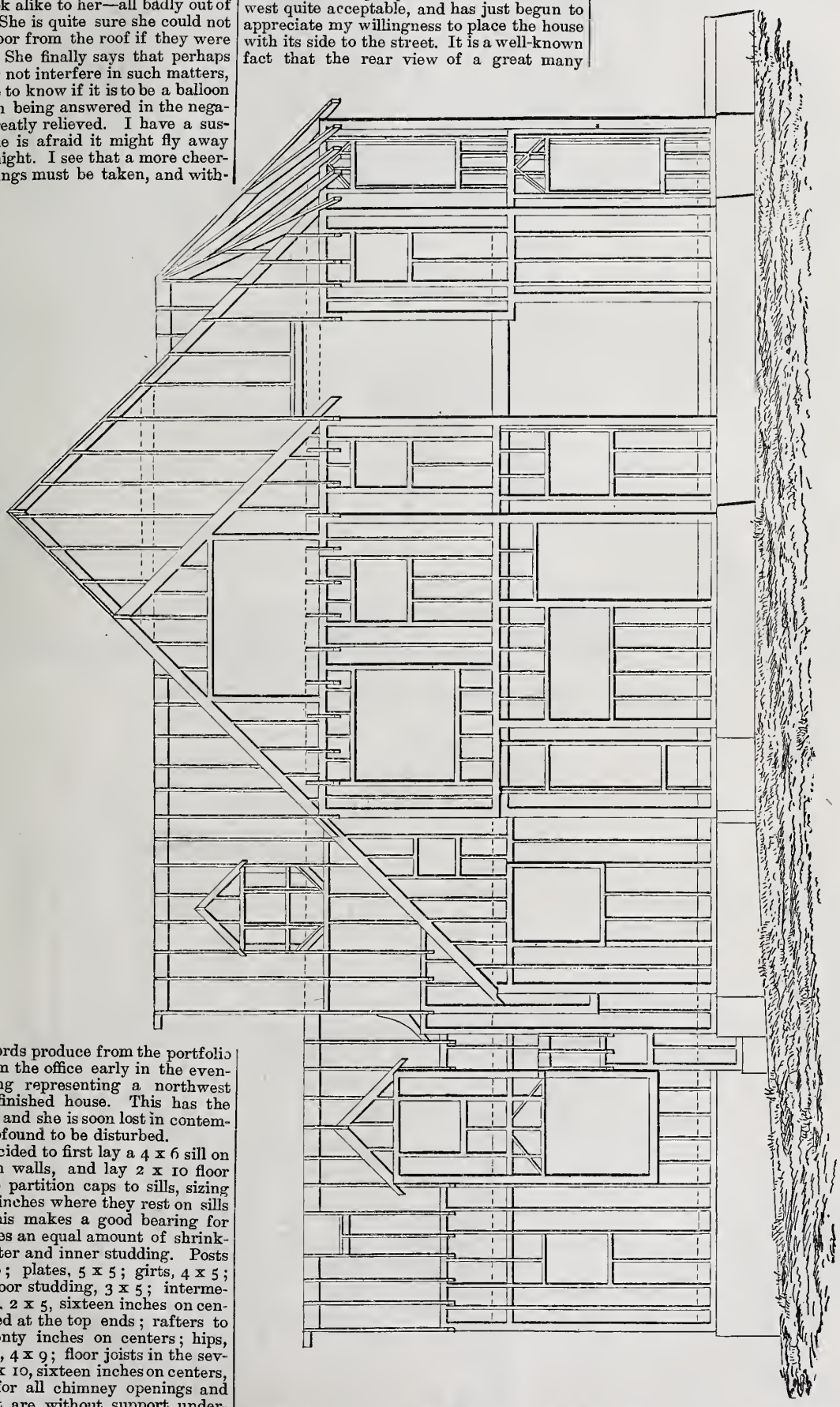
### The Framing Plans.

Mrs. Archie does not seem to be at all carried away with this particular part of house planning, and remarks that all the elevations of framing look alike to her—all badly out of proportion. She is quite sure she could not tell the first floor from the roof if they were not lettered. She finally says that perhaps she had better not interfere in such matters, but would like to know if it is to be a balloon frame, and on being answered in the negative, seems greatly relieved. I have a suspicion that she is afraid it might fly away some stormy night. I see that a more cheerful view of things must be taken, and without further words produce from the portfolio (smuggled from the office early in the evening) a drawing representing a northwest view of the finished house. This has the desired effect, and she is soon lost in contemplation too profound to be disturbed.

We have decided to first lay a 4 x 6 sill on the foundation walls, and lay 2 x 10 floor joists from the partition caps to sills, sizing the joists to 9 inches where they rest on sills and caps. This makes a good bearing for joists, and gives an equal amount of shrinkage to both outer and inner studding. Posts are to be 5 x 6; plates, 5 x 5; girts, 4 x 5; window and door studding, 3 x 5; intermediate studding, 2 x 5, sixteen inches on centers and framed at the top ends; rafters to be 2 x 7, twenty inches on centers; hips, 3 x 9; valleys, 4 x 9; floor joists in the several stories, 2 x 10, sixteen inches on centers, using 4 x 10 for all chimney openings and partitions that are without support underneath. All principal timbers are to be mortised, tenoned and pinned. Material will be sound, well seasoned, straight, sawed spruce, all mill-sized. Third-floor joists will be locked over plate. This makes a good tie and is used where the attic rooms are not especially desired. Should better rooms be required, the plate should be raised to a hight of at least 2 feet above the third-story floor, and the joist in that case would rest on a ribbon.

I think the scratching of my pen has awakened Mrs. Archie from her dream. She thinks the perspective from the northwest quite acceptable, and has just begun to appreciate my willingness to place the house with its side to the street. It is a well-known fact that the rear view of a great many houses is the best, and the reason for this is obvious. But even my best effort at perspective does not escape disparagement, and I am quietly informed that the immediate vicinity of our aforesaid neighbor's property looks like a desert, and the beautiful blue distance not very blue nor very distant. This would be hard to bear if such things had not been heard before, and—she is forgiven.

*The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.



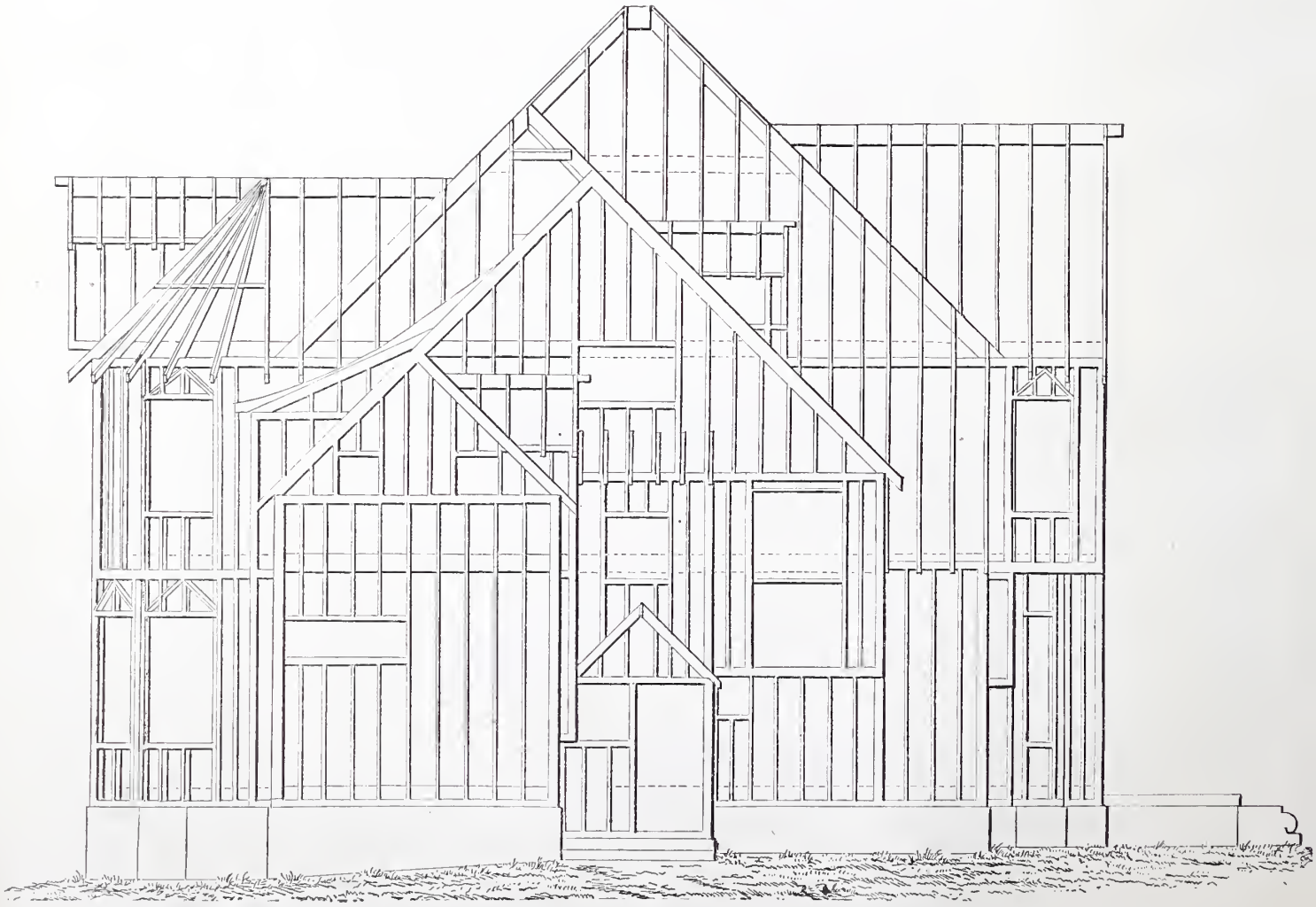
*A Study in Suburban Architecture.—Framing Plan, Showing the Timbering of Principal Front.—Scale, ⅛ Inch to the Foot.*

## Brickmaking Machinery.

In our issue for February we published an article on the subject of brickmaking machinery, from the pen of Mr. P. Barnes, a well-known practical writer. Continuing a consideration of the general subject presented in that article, this author goes into an investigation of other sides of the question, and his remarks will undoubtedly be of interest to our readers:

Referring more closely to the commercial side of the question as to the use of better machinery, two or three things may be said. One is that so long as brickmakers are at

*A Study in Suburban Architecture.—Framing Plan of South End.*

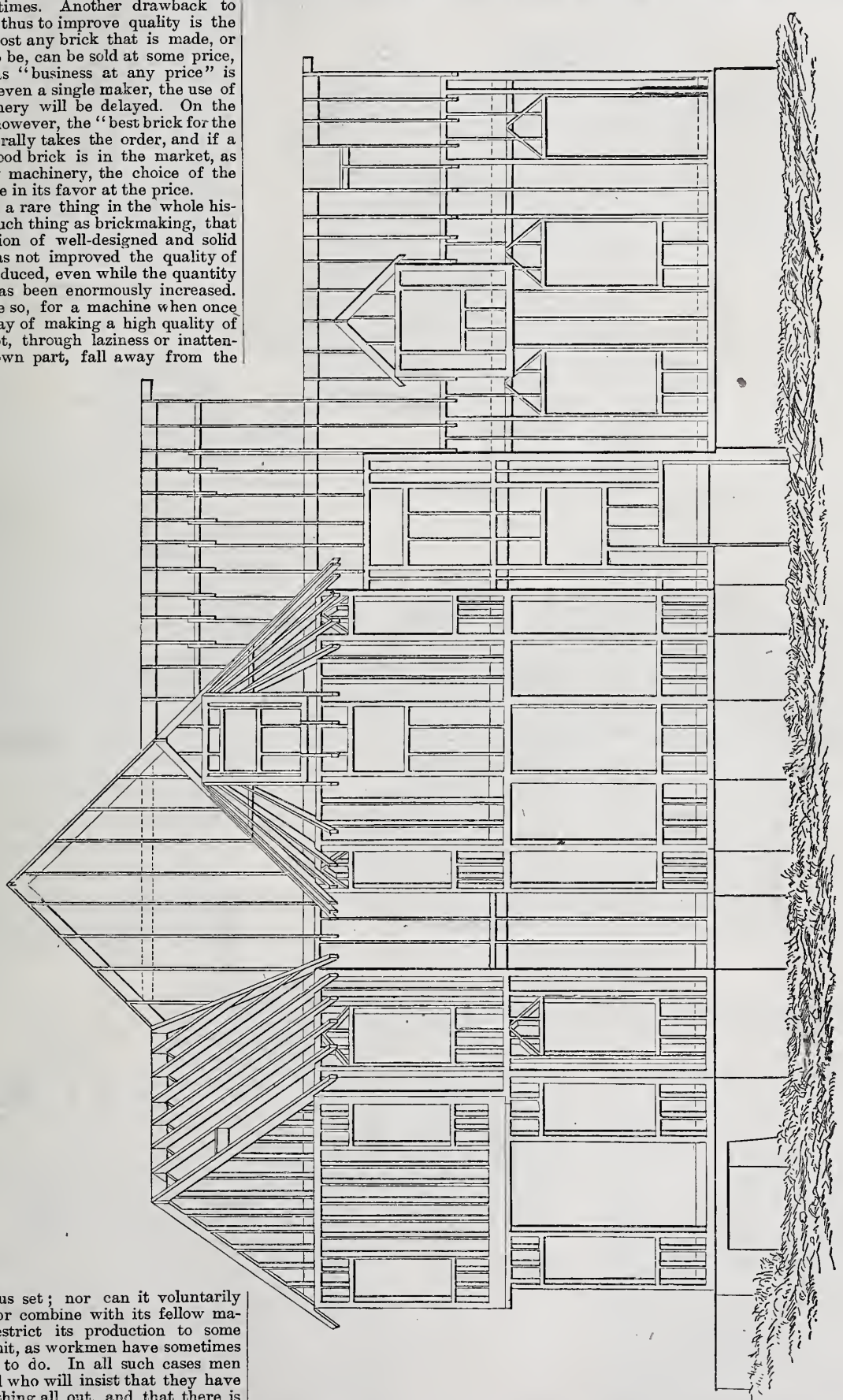


*Framing Plan of North End.—Scale, ⅛ Inch to the Foot*

work on leased premises only, they may naturally feel some reluctance to invest in buildings and machinery foundations, which must be moved or abandoned possibly at an early day. Careful arrangement of parts can do much, however, to provent loss in this way, and machines that are thoroughly well built will stand moving, if need be, a good many times. Another drawback to any attempts thus to improve quality is the fact that almost any brick that is made, or even likely to be, can be sold at some price, and so long as "business at any price" is the motto of even a single maker, the use of better machinery will be delayed. On the other hand, however, the "best brick for the money" generally takes the order, and if a thoroughly good brick is in the market, as thus made by machinery, the choice of the buyer must be in its favor at the price.

It has been a rare thing in the whole history of any such thing as brickmaking, that the introduction of well-designed and solid machinery has not improved the quality of the goods produced, even while the quantity turned out has been enormously increased. This must be so, for a machine when once put in the way of making a high quality of work does not, through laziness or inattention on its own part, fall away from the standard thus set; nor can it voluntarily quit work, or combine with its fellow machines to restrict its production to some arbitrary limit, as workmen have sometimes been known to do. In all such cases men can be found who will insist that they have figured this thing all out, and that there is and can be no money in it. For such men there rarely is money in anything very long, but it would be found upon inquiry to be true, in many lines of manufacture now fully established, that in their earlier history the use of improved machinery has been objected to as inexpedient and impracticable. Indeed, the successful introduction of such machinery has often been accomplished in the face of storms of objection more strenuous than even brickmakers of the present day are likely to raise against any improvement in their art.

Another special objection to the use of machines of a more costly type is that the winter prevents not only the making of brick, but their laying as well, and hence the capital invested in such machines must be wholly unproductive for an important part of the year. While this is true enough, it is also true that with improved facilities in the summer's work a larger product can be made than would be otherwise, and hence the year's work can be fully maintained in a just paying proportion to the former methods. In all large cities the price of red brick is a very important element, probably as vital as any, in the general advance of building operations, and while cuts in prices, in the ordinary sense of the word, do not aid permanently in the development of business, yet the careful preparation for a reduction in cost, as in brickmaking, does bear materially upon the consumption of the product thus cheapened.



*A Study in Suburban Architecture.—Framing Plan of Rear.—Scale, ⅛ Inch to the Foot.*

Messrs. William B. Scaife & Sons, of Pittsburgh, Pa., have been awarded the contract for the iron roof frame for the new court house that is in course of construction at Hartford, Conn.

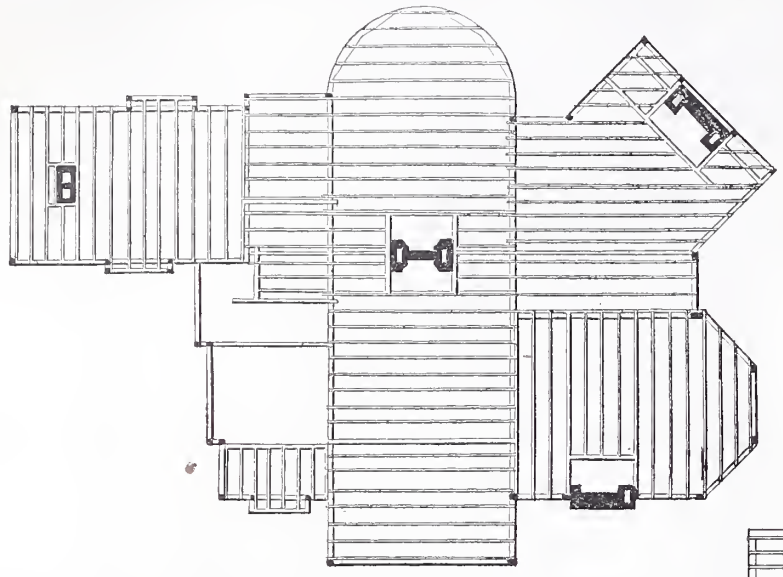
## TRADE PUBLICATIONS.

### Wood-Working Machinery

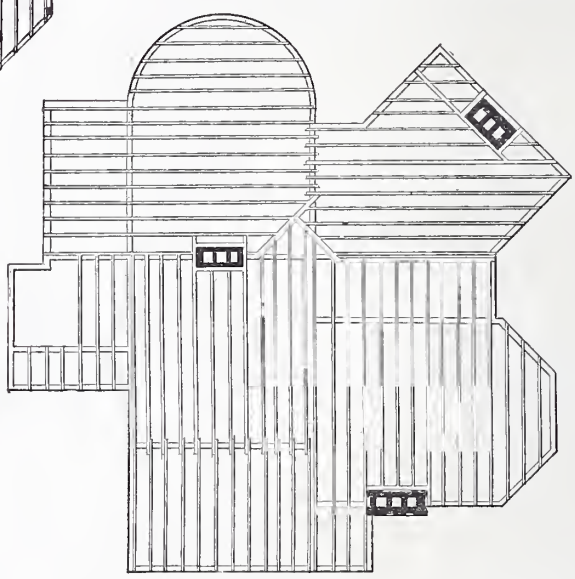
Messrs. Goodell & Waters, 3103 Chestnut street, Philadelphia, manufacturers of wood-working machinery, have recently issued a very handsome quarto catalogue of 116 pages, devoted to a description of the various machines and tools of their production. Four classes of machinery are described in this book, being planers, car machinery, sash and door machinery and miscellaneous devices. The company state that while maintaining the highest standard for all the machinery produced, they point with especial pride to their list of planers that are subdivided into the following classes: Pony planers, roll-feed lowering-bed planers, Woodwerth planers and endless-bed planing machines. The catalogue throughout has been prepared with great care, and contains precisely that information that planing-mill men and others considering the subject of wood-working machinery require. The illustrations are good examples of the engraver's art, and show in a very satisfactory manner the various mechanical devices employed. The entire work is supplemented by an alphabetical index, which greatly facilitates reference.

### The Durham System of House Drainage.

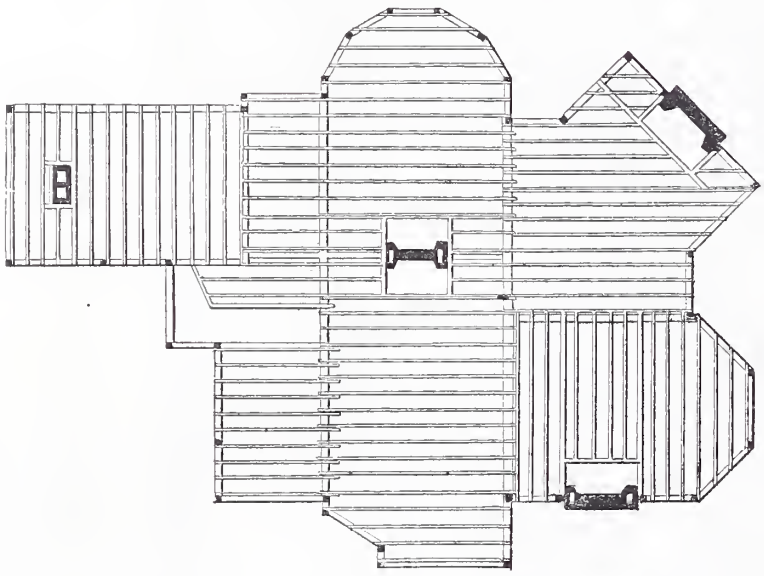
The Durham House Drainage Company, No. 187 Broadway, have issued a little volume illustrating and describing the Durham system, as compared with other systems, of plumbing and drain laying. So far as materials and methods of jointing are concerned, the system seems to be an excellent one, though no better in these respects than that followed in ordinary plumbing work when suitable materials are used and joints are calked with lead. The house-drain is trapped, which we consider doubly objectionable when the pipe work is properly put in, as it claims to be in this system, and the air-pipe, which relieves what would otherwise be an air cushion against the seal of the trap, is carried out and finds vent in the gutter. In the event of typhoid fever in a house thus piped, we should much rather take the other side of the street, or preferably another street. The Durham system conforms to the plumbing regulations of the New York Board of Health, which are model regulations in every other respect than the requirement of a trap in the house-drain. In the pamphlet before us the claims of the system to public favor are very strongly stated, but the argument derives no strength from the dishonest condemnation of other methods which are just as good. In good plumbing practice none of the evils described as inherent in the unpatented system do or can exist. Comparing a good job done on the Durham system with a bad job done in the ordinary way, the former has a marked advantage, but such a basis of comparison is not quite honest, though undoubtedly it is effective in an advertisement.



*A Study in Suburban Architecture.—Timbering of First Floor.—Scale. 1-16th Inch to the Foot.*

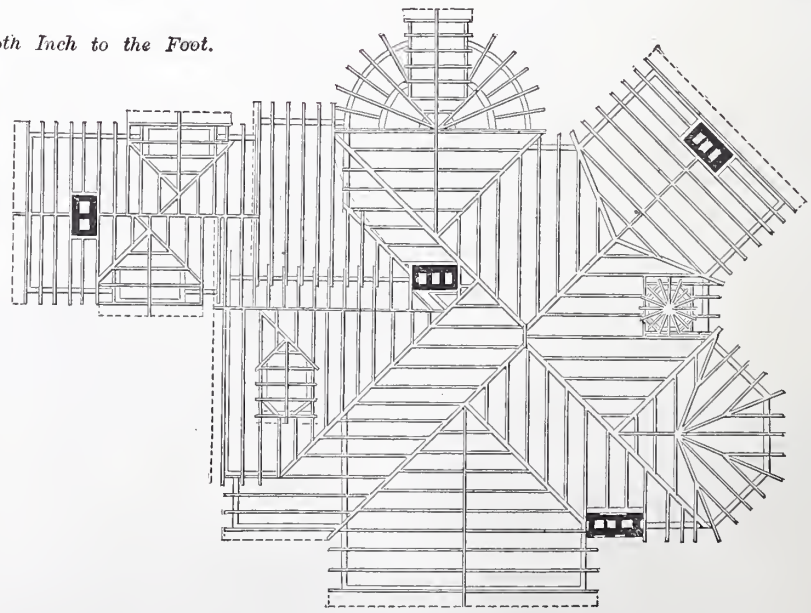


*Timbering of Attic Floor.—Scale, 1-16th Inch to the Foot.*



*Timbering of Second Floor.—Scale, 1-16th Inch to the Foot.*

The firm formerly known as French, Richards & Co., York avenue and Callowhill street, Philadelphia, has been reorganized under the name and style of Samuel H. French & Co., and will continue the manufacture of paints and the plaster and cement business heretofore conducted by the old firm. The new concern adds to its business that of builders' supplies, this department being under the personal supervision of Mr. William A. French.

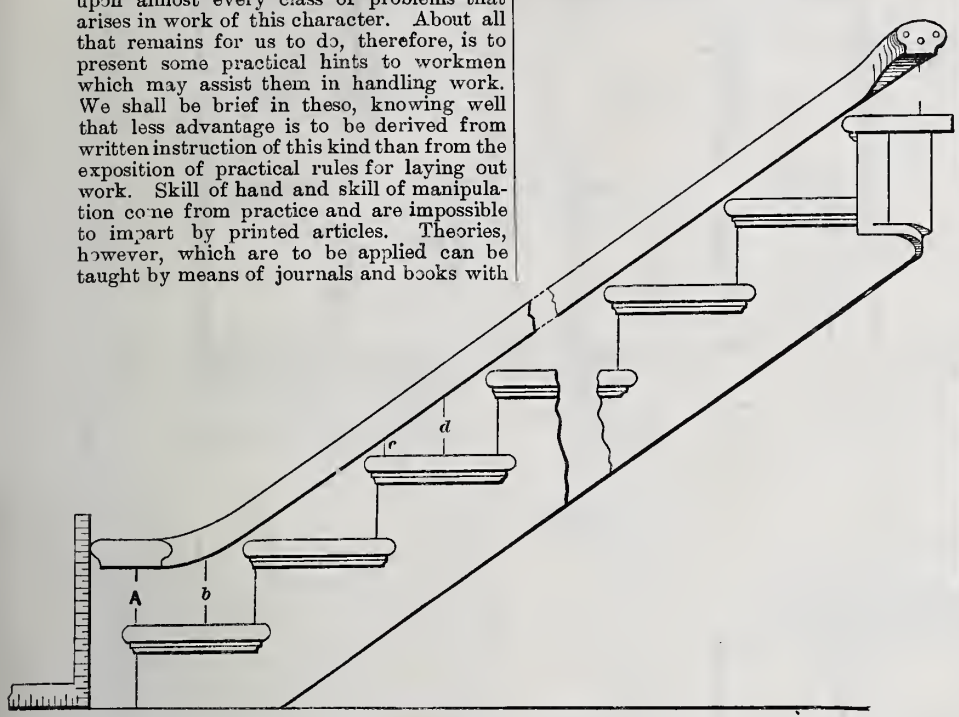


*Timber Plan of Roof.—Scale, 1-16th Inch to the Foot.*

## Practical Stair-Building.—XXV.

DIRECTIONS TO WORKMEN.

In the course of the papers that have been published in *Carpentry and Building* during the past two years and upward we have given a brief course in stair-building, and have touched with more or less thoroughness upon almost every class of problems that arises in work of this character. About all that remains for us to do, therefore, is to present some practical hints to workmen which may assist them in handling work. We shall be brief in these, knowing well that less advantage is to be derived from written instruction of this kind than from the exposition of practical rules for laying out work. Skill of hand and skill of manipulation come from practice and are impossible to impart by printed articles. Theories, however, which are to be applied can be taught by means of journals and books with very satisfactory results. One of the first things to which we shall direct attention is that of measuring the rail, the general method of which can be gained from an examination of Figs. 1, 2 and 3 of the engravings submitted herewith. Level rails that have a newel post at one end should be measured from the center of the post. When there are crooks at the end, measure the whole length, using for this purpose the center line of the rail, and include the crooks. To take the length of the rail for a straight flight of stairs, first mark the second riser line on the lower easement piece in the general manner shown at C, in Fig. 2. On the pitch-board draw a line parallel with the riser edge, making *a b* equal to the distance from the center of the newel cap to the point of the miter. Set the pitch-board up against the easement piece, with the line at *b* even with the end of the piece. Make a mark at the upper end of the pitch-board. Move the pitch-board and by it mark a plumb-line on the piece, as shown by 2 in the diagram just named. This line is the plumb-line of the second riser.




*Practical Stair-Building.—Fig. 1.—Measuring the Rail.*

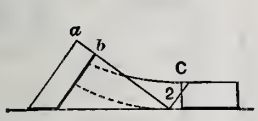



*Fig. 2.—Application of the Pitch-Board to an Easement Piece to Determine the Plumb Line of the Second Riser.*

Mark the top of the riser line on the top crook, as shown in Fig. 3. To do this lay the the crook on the bench with the straight part at *c* resting if necessary on a thin piece of board. On the pitch-board draw a line parallel with the riser edge, making *a b* to represent the distance from the top of the riser line to the back side of the circle. Set the pitch-board up against the joint at *a*, bringing the riser edge to the center of the joint. Make a mark on the bench at *b*. Use the pitch-board for a square, and draw a line from *b* to the crook square with the straight part. Set up the pitch-board against the straight part in the same manner as before, and by its riser edge from the line at *b* draw on the crook the plumb-line on the top riser. At the center of the plumb-line draw a line square across the edge of the piece, as shown in the illustration; also across the lower easement piece draw a similar line at the second riser. Between these two points measure off as many times the length of the pitch-board as is required by the number of risers on the stairs. Use the pitch-board for measuring the straight rail on all flights of stairs.

Another matter to which we would direct attention at this time is the general plan of proceeding in mitering the cap. In Fig. 4 is shown an appliance convenient for use in operations of this character. It consists of a piece of plank 2 or 3 inches in thickness, having a surface of about 6 x 18 inches, with saw cuts at the top and a sliding piece dovetailed across at about the center. From the middle of the sliding piece projects a long screw driven through from the back piece. At the portion marked M in the engraving the appliance is set upright in the vise. The width of the rail is marked on the newel cap by the compasses set to the proper width. The cap is then turned on to the screw, and its miter is made by sawing into it from the saw cuts in the block. The saw cuts are made at the proper distances each way from the center, so as to cut the desired miter lines of the cap. The sliding piece is graduated like a rule, with inches and fractions on the top edge, for convenience in setting.

*Fig. 3.—Application of the Pitch-Board to an Easement Piece in Determining the Plumb Line of the Top Riser.*

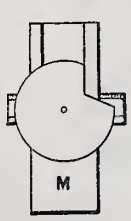



*Fig. 4.—Mitering a Newel Cap.*

The edge of the newel cap should be turned to correspond with the half pattern of the rail with which it is to be employed. Before mitering the cap, measure the moldings on its edge in ordor to see that they correspond with the rail. If they do, the miter should extend into the cap half the width of the rail. If they vary in depth from the side pattern of the rail, then the miter must be made either deeper or shallower, so that when the rail-piece which joins the cap is molded its various members will have their proper width.

To miter the end of the rail-piece where it joins the cap proceed as follows: After the miter of the cap has been cut, lay the cap on the bench and bring a bench plane up against the opening. Now with a rule measure the depth of the miter. Set a gauge to this depth, and from the end gauge on to both edges of the post. Set the gauge to half the width of the rail, and from both edges gauge on the center line of the miter. Cut the miter with the saw and fit it with a plane. After fitting the miter, draw the pitch of the cap by the pitch-board, as shown in Fig. 5.

## Brazing Band-Saws.

A correspondent of *Engineering* says: "There appears to be a growing fashion for brazing band-saws with gas blow-pipes, and as a maker I am continually being asked for apparatus for this purpose. It is not possible to reply privately to all, and no doubt some information on this point will be useful to your readers. If gas is once used to braze a band-saw its use is continued as a matter of convenience, and after a short time breakages gradually increase in number. As these do not occur exactly at the joint, no blame is attached to the use of gas, and the cause of continual failures is rarely, if ever, discovered. It is well known that a gas flame not only scales steel deeply, but also destroys the nature by burning the carbon out, and this occurs especially at the edges of the flame. Band-saws brazed by gas almost invariably break again at a point some little distance from the previous fracture, at a point where the outer edge of the flame has damaged the metal. A large proportion of the users seem to be completely puzzled as to the method of repairing easily. The only really satisfactory way is to make a thick, heavy pair of tongs bright red-hot and clamp the joint with them. The heat melts the spelter instantly and makes a good joint without scaling or damaging the steel. For a joint which has to stand constant heavy strains and bending, it is better to use an alloy of equal parts of coin silver and copper, melted together and rolled out thin. This alloy never burns, cannot be overheated, and makes first-rate joints, which will stand hammering and bending to almost any extent."

The New York Bureau of Buildings during the year 1882 issued 2561 permits for the erection of new buildings and 1679 permits for the alteration of old buildings. By reference to the books of the bureau it was ascertained that the bulk of the year's building operations was done below Fifty-fifth street. Those buildings which have been erected up town are nearly all brick dwelling-houses and French flats, although there was a decided falling off in the latter class of buildings, as compared with the figures of the previous year. The aggregate cost for new buildings during the year was $44,778,686, and for alterations $4,267,181, making a total of $49,045,867. This sum, as compared with figures for 1881, shows an increase in the amount expended of over $1,000,000. The majority of the new buildings erected within a year were far more elegant than have ever been put up in this city in one year. Modern improvements were used in every instance.

*Fig. 5.—Trying Pitch of a Cap by the Pitch Board.*

## The Tenth Competition.

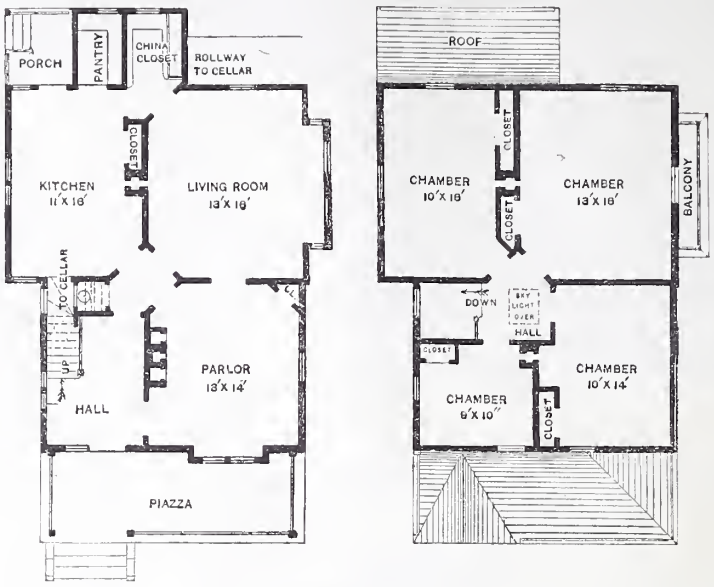
The Tenth Competition advertised by *Carpentry and Building*, and which closed with the last day of January, was a very popular one, if we may judge by the number of entries that were made. From a large number of competitors the committee to whom was intrusted the matter of selection have chosen 15 sets of floor-plans, which in their judgment were the best of all submitted. The same have been engraved, and are now laid before our readers, in order that they may make their own selection, and by means of voting, as in other competitions, decide which set of plans is the most popular, and which, therefore, is entitled to the first prize. In the advertising pages of this issue will be found a blank form of ballot that must be used in voting in this contest. Every reader of the paper is entitled to a vote, and all are urged to manifest their interest in this matter by clipping from the page the ballot in question, filling it out according to their preference and mailing it to this office.

There are several results to be reached by such a vote, provided it is spontaneous in character. We not only ascertain which is the most popular set of floor-plans, but we are also enabled to judge of the relative popularity of different plans in different sections of the country. Matters of this kind have been carefully canvassed in previous cases, and have proved of no small interest to our readers. We therefore urge upon all the advisability of voting, with the promise that we will analyze the vote in such a way as to show results of the character just mentioned.

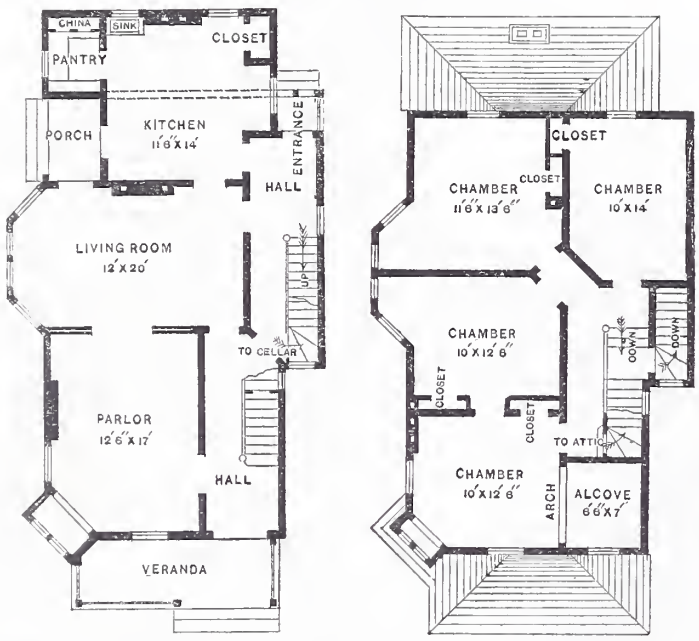
All ballots must reach this office on or before March 20. Ballots coming to hand after that date will not be counted.

The committee have made some notes concerning their work, from which we glean the following particulars: In spite of the fact that the original announcement expressly stated that this contest was to be in cheap seven-room houses, some very elaborate plans were submitted that could in no wise be termed cheap. While the contest was restricted to seven-room houses, a number of eight-room houses were sent in, while some of them, if large reception halls were to be counted, might be regarded as nine or ten room houses. The exception with reference to plumbing did not deter some competitors from providing bath-rooms, set basins, laundry tubs and water-closets. The only course open to the committee under these circumstances was to throw out plans that so radically violated the spirit of the specification.

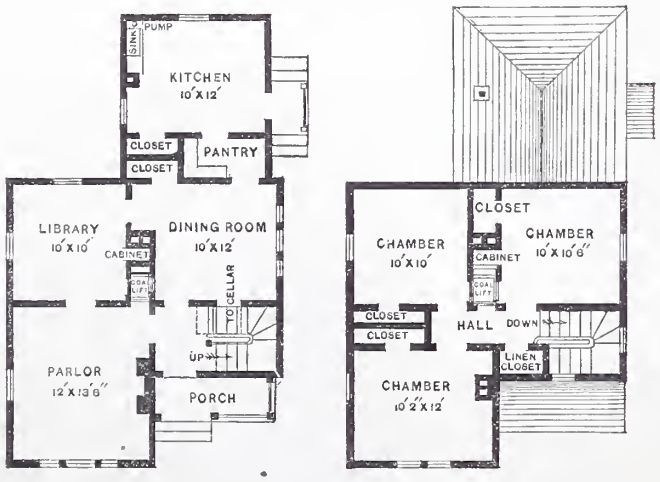
Not a little ingenuity was manifested by competitors in apparent attempts to smuggle eight-room houses into the contest. Reception halls, in one or two cases as large as 9 x 12 feet, provided with windows and fireplace, were shown. To count such an apartment as a room would give an eight-room house, and yet to have passed it as a hall, as probably the auther designed should be done, would have been manifestly wrong. In one or two cases closets large enough to contain a full set of bedroom furniture were shown, which it seemed to the committee would not have been called closets if the contest had been in eight-room instead of seven-room houses. One competitor showed a division of the house of this general character that contained neither name nor dimensions, while all other parts of his plans were named and figured. This, it seemed to the com-



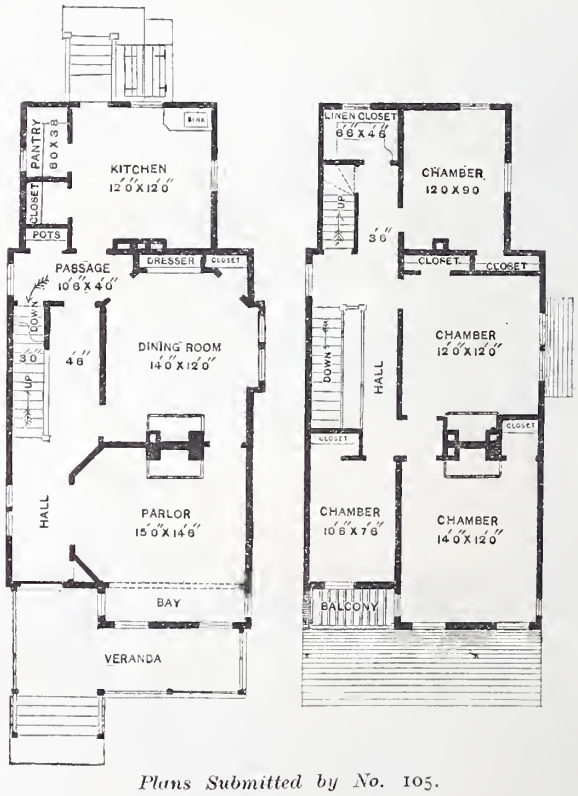

*Plans Submitted by No. 45.*




*Tenth Competition.—Plans Submitted by No. 41.—Scale, 1-16th Inch to the Foot.*




*Plans Submitted by No. 86.*

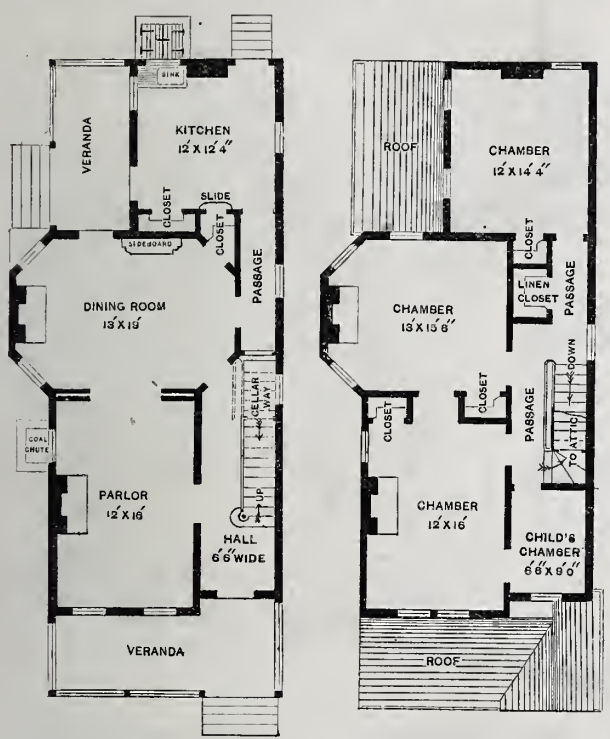



*Plans Submitted by No. 105.*

mittee, was scarcely an accident, and the set of plans containing this feature was unhesitatingly put with others showing eight rooms.

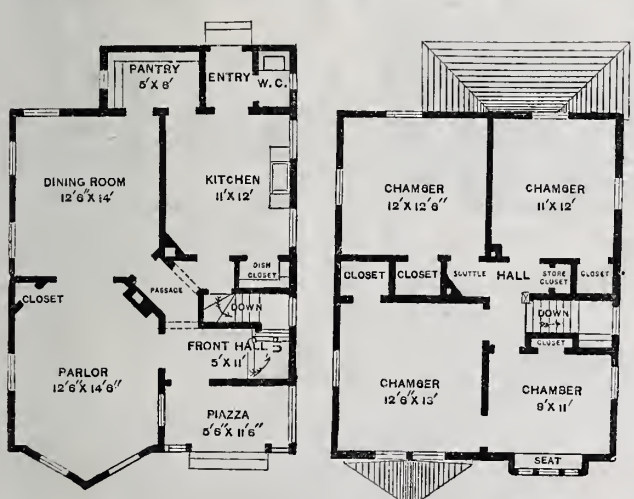
## The Estimate Competition.

The subject of the Eighth Competition, as advertised for several months past, is a detailed estimate of cost of building the house, the elevations and details of which were shown in the July number of *Carpentry and Building*, according to the specification of "Star," published in the number for last October. According to our announcement,




*Tenth Competition.—Plans Submitted by No. 131.—Scale. 1-16th Inch to the Foot.*

this competition was open until January 31. So few entries, however, were made that it seems to us probable that many of our readers who are competent to take part in such a contest have failed to notice it. Accordingly, it has been deemed wise to return to the competitors the efforts submitted and to reopen the contest, as will be



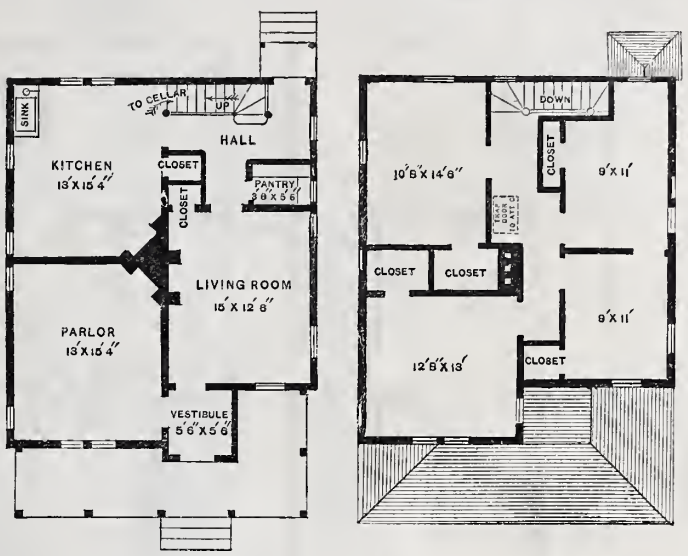

*Plans Submitted by No. 138.*

seen by the advertising pages of this issue. In directing attention to it in this manner we hope to enlist a larger number than would otherwise take part.

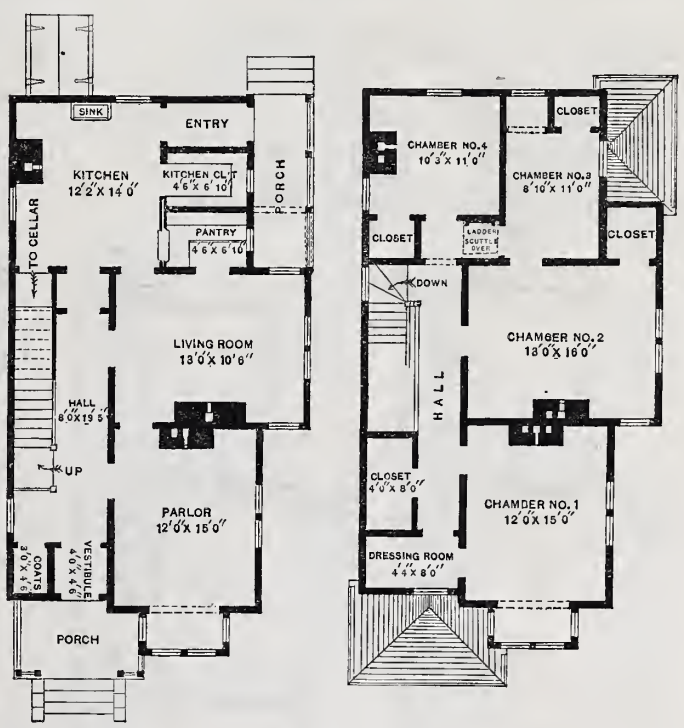
The importance of the subject of estimating need hardly be recited in this connection. It is at the bottom of a very large proportion of all the business transacted by carpenters and builders. Not only do profits depend upon correct estimates, but also the preservation of invested capital. The ability to estimate correctly, therefore, goes hand in hand with the ability to perform work in a satisfactory manner after a contract is once obtained. The object of this contest has been to excite friendly emulation among builders as to the manner of making estimates and the general scheme of arrangement, with careful consideration of details. We think there is no one subject of greater importance to builders than this. As announced in the original advertisement, to make this contest of the greatest value to our readers we propose to publish some of the efforts submitted side by side, in order to afford the greatest possible opportunity for comparison. Of course, we shall fail in this unless there is lively interest manifested in the competition and a sufficient number of entries made to admit of selection for publication.

Aside from the interest attaching to this contest in itself, we call attention to the prizes that are offered. To the party submitting the best estimate the sum of $50 will be paid. To the person submitting the second best, $30, and to the one submitting the third best, $20. Since builders are in the habit of making estimates very freely and upon all kinds of work without any compensation whatever, it would seem that the cash prizes above named would be sufficient to warrant a little exertion in this direction.

It is hardly necessary to direct our readers' attention to the fact that the figures at which the house is estimated will have no effect in determining this contest. We think best to have prices and extensions in the estimate merely as a means of facilitating the work; therefore, each is invited to estimate the work according to the prices with which he is best acquainted—namely, those ruling in his own community. The points that will be considered in deciding the contest will be the general arrangement of the estimate, the analysis employed, and the general utility. A committee will select from all the efforts submitted a reasonable number for publication in the columns of this journal. From these our readers will be invited to select according to their judg-

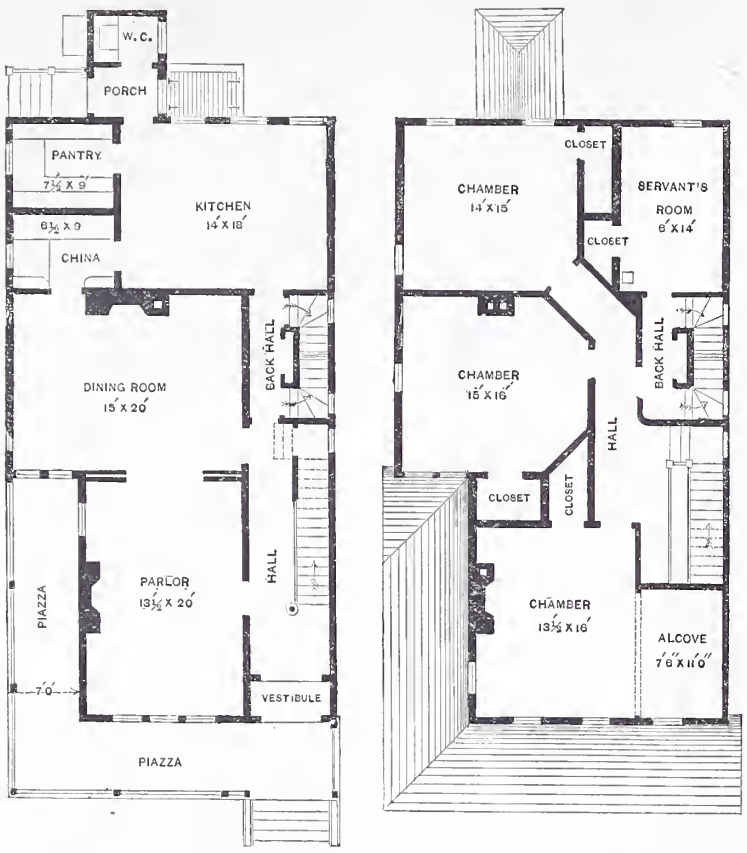



*Plans Submitted by No. 50.*




*Plans Submitted by No. 109.*

ment for the final award of prizes. We trust all who read this notice will feel an interest in this contest, and that we may have so large a list upon the next date advertised that the scheme of the competition may be carried out to the advantage of our readers in general.




*Tenth Competition.—Plans Submitted by No. 38.—Scale, 1-16th Inch to the Foot.*

## Plans of Seaside Cottages.

A humorous writer in one of the comic weeklies some time since got off a drive at the peculiarities of planning frequently employed in seaside cottages that will doubtless be relished by our readers generally. Omitting portions of no particular relevancy, the story is as follows:

While one of our swellest architects was sitting in his office the other morning, reading a newspaper, a rather lonesome-looking man entered, and said:

"Do you ever teach the architect business?"

"I frequently take boys and instruct them in the art of making plans and specifications," responded the architect, as he turned the paper.

"That kinder knocks me out," piped the stranger, wearily, "but I just thought I'd sorter drop in and get the lay of the land. *Tumblez vous?*"

"I scarcely catch your meaning, sir," replied the architect, testily; "have you a son whom you desire to place under me for instruction?"

"No, I want instruction myself."

"But you are entirely too old to learn."

"No, I'm not, by a long shot."

"What is your occupation at present?"

"A burglar?"

"A what?"

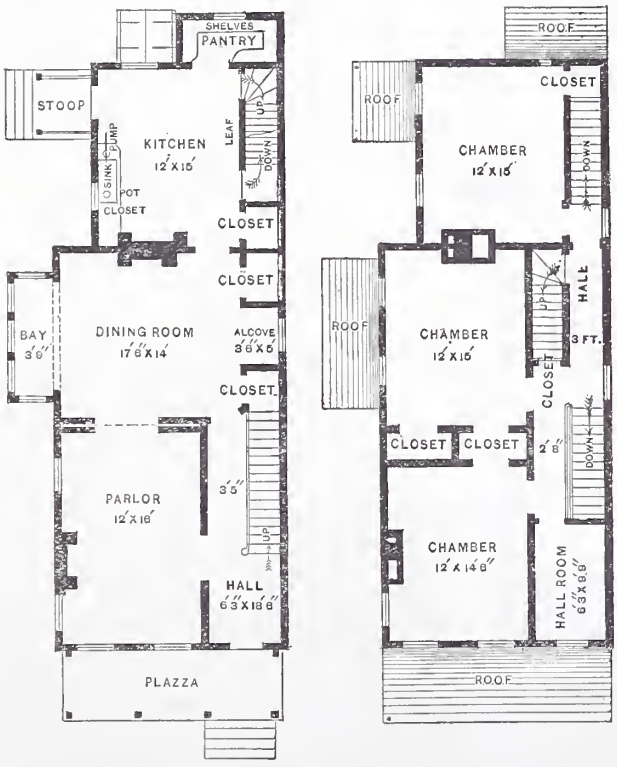
"A burglar—a b-u-r-g-l-a-r, burglar; that's what I am, and I ain't ashamed to own my calling. I am only a humble soldier in the great army, to be sure, but I am industrious and full of hope."

"And why do you want to study architecture?"

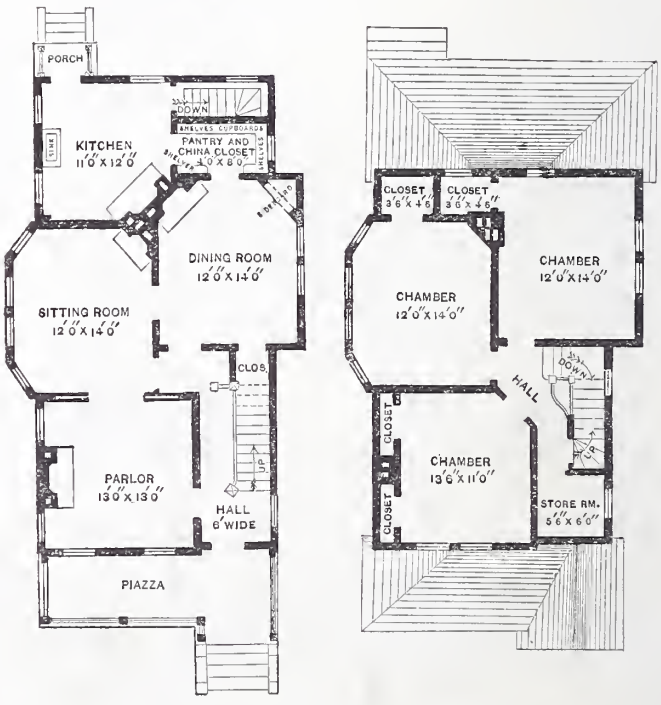
"To get the hang of the seaside cottages. I know how the city houses are laid out, because I have frequently been laid out in them myself. I know where all the burglar alarms are located; I know all the $2000 per annum people that are trying to keep up a $5000 appearance, with plated-ware and furniture on the installment plan, and a big bill at the butcher's, and the girls' dresses made over, and the old lady dodging around in society, and the old man dodging around to evade the sheriff. I know just the places to strike for a haul, and brown-stone fronts do well enough for the winter. But for summer burglaring give me the quaint octagonal cottages, painted brick-red and bottle-green, with rare exotics set out in butter-tubs, and Eastlake furniture from head to foot, and a *porte cochère*. Those are the places to strike wealth."

"What has architecture to do with such a scheme?"

"A great deal. Without a certain amount of technical knowledge, no burglar, however respectably he may stand in his profession, can hope to cope successfully with the airy fancies and delicate conceits of eccentric architecture, because every cottage is constructed differently. It is very easy to enter, but decidedly difficult to get out. It seems to be but one step from the garret to the cellar, and when you leave a room you find the dog-house instead of a hallway; and when you evacuate the stoop to step into the dining-room, you find yourself in the cupola. Then, when you want to get out, you can find everything you want except the back door. You can find lots of wine, and bark your shins over a Queen Anne hat-rack, covered with six-dollar hats, and lie down on a nice soft lounge, or go into the library and read standard works in handsome bindings, but you can't find the door. And then, when the Southern bloodhound lets off a Peruvian



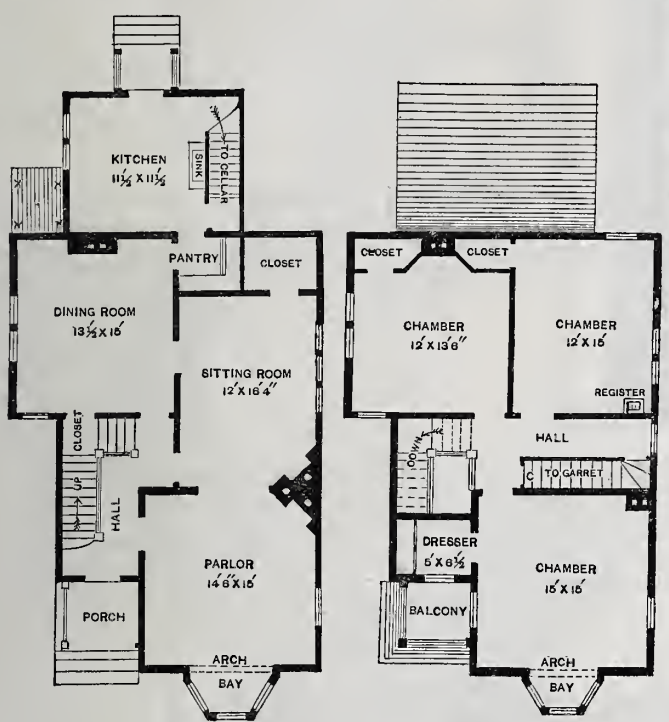

*Plans Submitted by No. 4.*




*Plans Submitted by No. 92.*

bark that gives you a fresh set of chills, and the proprietor comes forth with a gun and treats you to a round of duck-shot, a pretty lively chase begins. The owner, knowing all the rooms, can figure on heading you off anywhere, while you can't tell what you are steering for. You are about as successfully lost as were the Children of Israel, and the only short-cut you get is a cut over the head with a club, as the coachman and the owner's son scoop you up in a lawn tennis net and carry you out to the authorities."

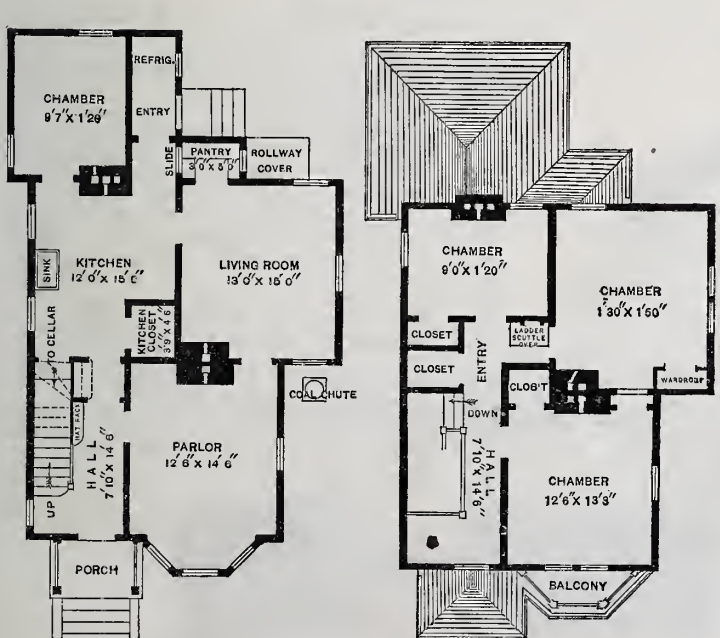
"I have no opening for a pupil," broke in the architect.




*Tenth Competition.—Plans Submitted by No. 15.—Scale, 1-16th Inch to the Foot.*

"Then why didn't you say so before, and not let me get off such a long toot? I don't think it right to play it so low down on a one-lunged man. But will you give me a few cottage plans to study?"

"No, sir; but I'll send for a policeman if you don't get out."

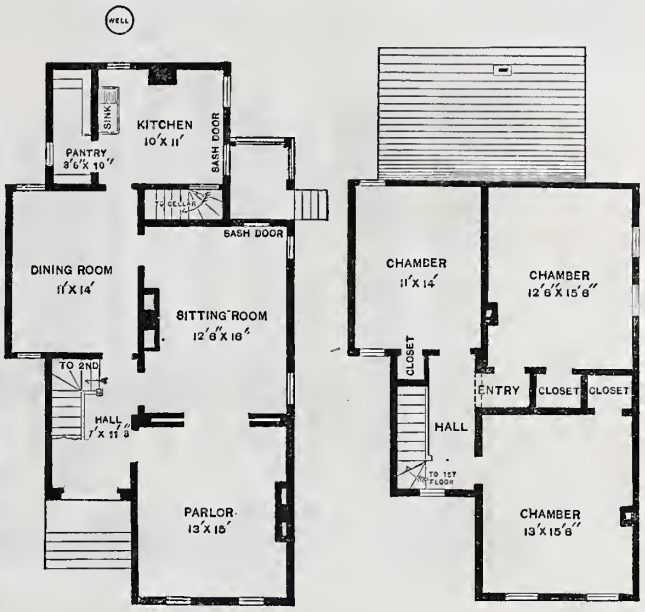



*Plans Submitted by No. 107.*

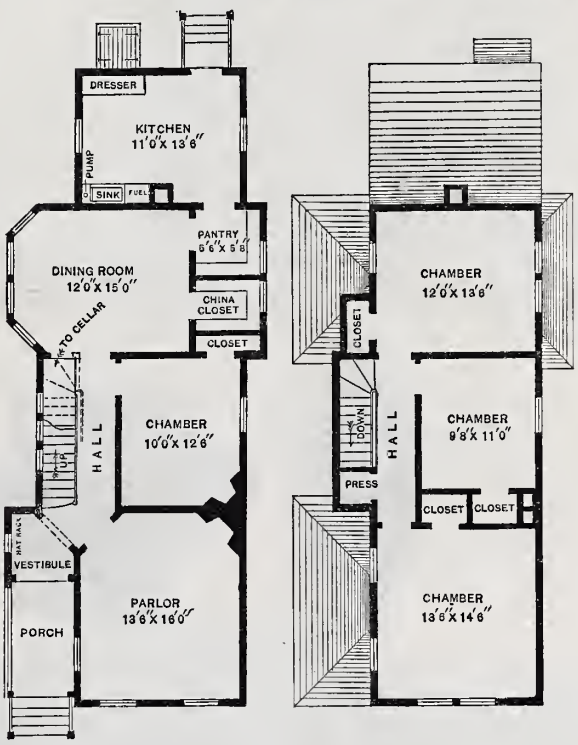
It is not necessary to give the conclusion, as our sole object in introducing the subject at all was to show the supposititious burglar's estimates of the arrangment of seaside cottages.

## The Kinzua Viaduct.

From particulars concerning the Kinzua Viaduct, it appears that the structure consists of 20 towers, each composed of four wrought-iron Phœnix columns. These towers are of uniform dimensions at the top, being 10 feet in width and 38½ feet long, and at the highest point of the structure they are 103 feet in width and 38½ feet long at the bottom. They are erected upon square piers of cut stone laid in cement, placed one under each column. The spaces between these iron towers are bridged with 21 lattice girder trusses of great strength, each of 61 feet span. They are bolted through oval holes to the tops of the piers upon which they rest. The manner in which they are thus secured allows for variation of temperature, which will not exceed 150° F. The Phœnix columns composing the towers rest at their bases on movable plates, allowing for expansion and contraction of 1 inch transversely and 0.38 inch longitudinally, and are fastened by proper anchor-bolts, extending deep into the masonry, so as to secure them and the whole structure against wind pressure. It was necessary to do this, inasmuch as the viaduct is exposed to the severe winds which prevail in the Alleghenies during the winter season.




*Plans Submitted by No. 126.*



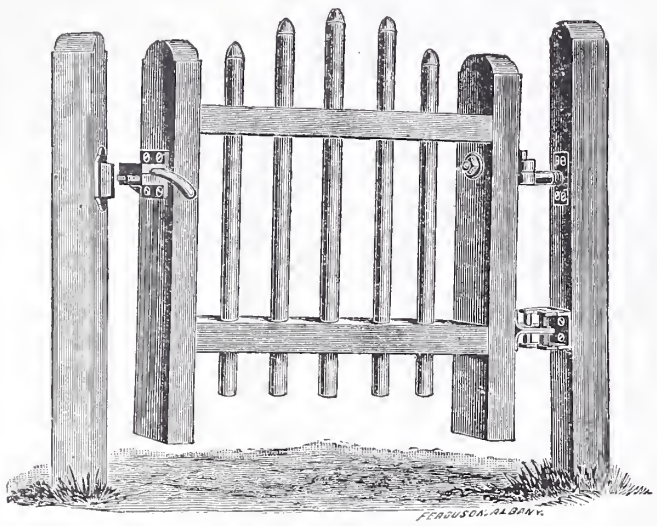

*Plans Submitted by No. 35.*

Messrs. D. & J. Jardine, architects, have prepared the designs for a large store building to be erected on Fifth avenue, between Fifty-ninth and Sixtieth streets, New York City, for Messrs. Park & Tilford, wholesale grocers. The structure will cover a plot of 11,250 square feet. The first story will be of iron, while above that will be brick, brown stone and terra-cotta.

## NOVELTIES.

### Improved Gate Trimmings.

Mr. John L. Reed, of Canajoharie, N. Y., has recently perfected an improvement in gate latches and hinges, the general features of which are clearly shown in Figs. 1 to 4 of the engravings. The gate latch is of the variety known as a gravity latch, and is so



*Novelties.—Fig. 1.—Improved Gate Trimmings, Manufactured by John L. Reed, Canajoharie, N. Y.*

arranged as to be applied to a gate that swings in either direction. Fig. 1 shows a gate with the trimmings we are describing fully applied, while Fig. 2 shows the latch itself. There are two independently operating catches, each provided with a crooked weighted handle that serves the double purpose of releasing the latch when the gate is to be opened, and by its weight of throwing it forward to hold the gate shut. In using a gate provided with this attachment, the weighted lever facing the person who desires to pass through is raised and the gate pushed from him. The arrangement of the hinges is such that the gate swings back and is held by the two latches shown in Fig. 2 engaging with the catch provided for the purpose. Fig. 3 shows the upper hinge, which, as will be seen, by means of the screw-plate that fastens to the post is adjustable in such

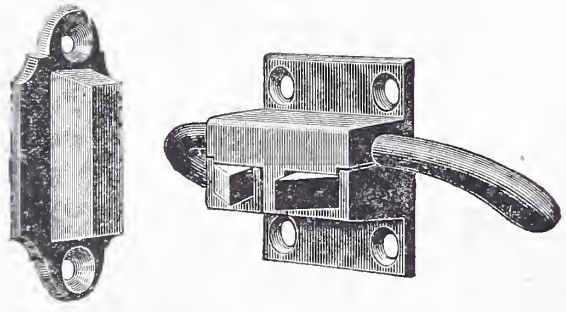


*Fig. 2.—View of Latch and Stop.*

a manner as to give the gate any rise on opening that may be desired. Fig. 4 shows the construction of the lower hinge which is used with a latch of this kind. The special advantages pertaining to these fixtures, as set forth by the manufacturer, are that no springs are employed; that all the parts are of cast iron and are of a character not liable to get out of order, and that the parts are of such a shape that a gate may be opened when the person desiring to pass is unable to use his hands, as in carrying something. The weighted lever can be moved very readily by touching it with the elbow. The construction is such that the gate may settle without disarranging the fastenings. The spaces between the gate and posts are the same for the hinges and latch, thus giving a good appearance to a gate fitted with them. The hinges shown in the engravings are made of wrought iron.

### Box's Patent Elevators.

Messrs. Alfred Box & Co., Nos. 312–316 Green street, Philadelphia, are offering a form of elevator that possesses features of interest to those who are concerned in the erection of warehouses and factories. The long list of accidents that have occurred from defective construction in elevators, bad design, wearing of wire ropes, &c., is so well known that it is hardly necessary to enter into a discussion of the dangers resulting from the employment of machinery of this character as ordinarily constructed. The effort has been made by this firm to lessen the dangers attending the use of elevators, and to provide a construction that will lift the load without danger of slipping of belts, and at the same time be furnished at a reasonable price. One of the most important sources of danger in the use of elevators as ordinarily constructed is the wire rope, which, when used over drums of small diameter, soon breaks, from the constant bending back and forth to which it is subjected. Almost every elevator in use is furnished with safety attachments for catching the carriage in case of an accident. To avoid difficulties of this kind, Messrs. Box & Co. have abolished the use of the wire rope, and have substituted in its place a chain made of double-refined charcoal iron, every link of which is made to fit a standard gauge, so that it meshes in the wheels like two cut gears. Besides the durability of the chain and the safety insured by its use two worms and wheels are employed instead of one, thus doing away with end thrusts and avoiding wear and strain on the castings. Elevators constructed upon this plan have been in use for several years past, and we are assured that those first erected are in good condition, and that no expense for repairs has been put upon them in the interval. Besides elevators, Messrs. Box & Co. manufacture portable double screw hoists, traveling cranes and machinists' tools.

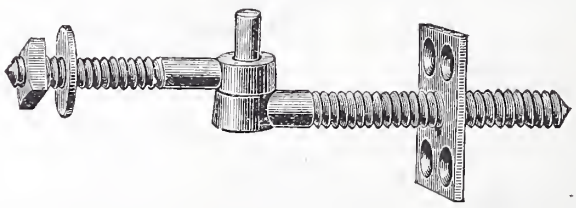


*Fig. 3.—The Upper Hinge.*

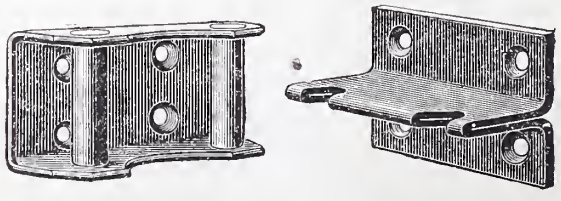


*Fig. 4.—The Lower Hinge.*

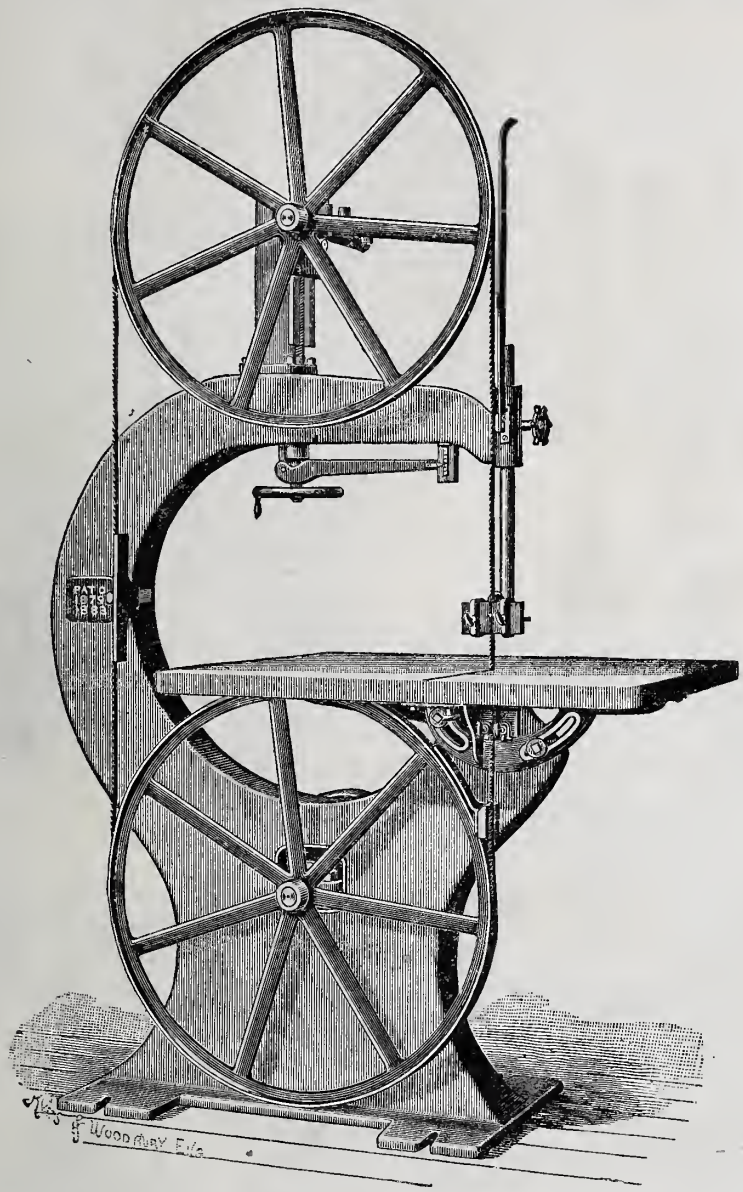
### Saw-Handle Fastener.

In the description of the saw-handle fastener now being offered to the trade by Mr. William McNiece, of Philadelphia, and which appeared on page 30 of our last issue, an error occurred. As may be seen by the engraving, instead of two bolts being used to connect the parts, both of which are operated by the screw-driver, one of the bolts has its head fastened to the upper face-piece and is screwed into place and into the lower face-piece by means of the upper piece used as a handle. After this has been done the pieces are brought into proper relationship to each other at the opposite end, where a loose bolt is inserted by means of the screw-driver. This fastener consists of thin strips of metal neatly engraved, so as to make it an ornament to any saw to which it may be fastened. The plates fit directly against the surface of the wood of the handle, which makes it possible to operate the parts in the way we have described.

### Band-Saw Straining Device.

Band-sawing machines are in such general use that almost every mechanic is acquainted with their general features, if not practically familiar with their operation. The principal details of construction have been so carefully considered that in all probability very little room for improvement remains to be made. However, minor features are receiving attention at the hands of inventors and manufacturers, and from time to time improvements are made that go to render this class of machines even more useful than they have been in the past. Mr. F. H. Clement, of Rochester, N. Y., manufacturer of wood-cutting specialties, has recently applied an index to the blade-straining device in the band-sawing machines manufactured by him, in a way to be of interest to all users of this class of machines. Fig. 5 of our engravings shows one of the machines manufactured by Mr. Clement embodying this improvement. Many saws, as our readers know, are strained by counterweights. An objection to this form

of construction is that light blades are strained rigidly when the weight is set for a wide blade and carelessly left by the operator in changing saws. Mr. Clement obviates this difficulty by straining the blades by means of a screw and lever, and attaching an index, whioh is so constructed as to show by means of a table when the proper strain is obtained for the blade that is being used. The index plate, as may be seen in the engraving, is immediately in front of the operator. There is always an elastic strain on the blade, no matter what its size, and nothing but the grossest carelessness can produce an overstrain.



*Novelties.—Fig. 5.—Band-Saw Straining Device, F. H. Clements, Rochester, N. Y.*

### Read's Patent Vise.

A vise embodying several features of interest and value has recently been perfected by Mr. F. H. Read, and is now being manufactured by Messrs. Read, Gleason & Read, 136 First street, Brooklyn, N. Y. Two forms are made, one in which the swivel lies entirely in one plane, as shown in Fig. 6, and the other, not here illustrated, which employs a ball and socket joint. The latter possesses peculiar advantages for use in stair-building shops and other places where crooked pieces are to be handled. Aside from the one special feature above named, the form of vise is like the section herewith presented and explained. The jaws are adjustable by the hand to within a very small distance of the part to be clamped, so that the slow motion of the screw is used to the smallest possible extent. This will be clearly understood by the following description: Referring to the engraving, it will be seen that the appliance is provided with a fixed and a movable jaw, the former being secured in the manner indicated in the illustrations, and the latter being furnished with a lateral projection, which contains the greater part of the working mechanism, and which passes through a suitable passage in the lower portion of the fixed jaw. This passage, together with the piece projecting from the lower part of the fixed jaw *r*, forms a guide for the movable jaw, which latter is free to slide in or out unless acted upon by the interior mechanism in the manner to be described hereafter. The lateral projection or sliding bar of the moveable jaw *u*, as already stated, contains a portion of the working mechanism, and for this purpose is box-shaped, being open at the lower side. A steel rack, *t t*, is attached to the stationary jaw by means of two bolts, *s s*, one end being at right angles to the length of the rack, and is made of such width as to fit easily into the open space of the sliding bar. The latter, as seen in the cut, contains a screw, *k*, operated by a handle outside of the apparatus, and carrying a steel nut, *g*, the lower side of which is provided with teeth made to operate in connection with the teeth of the rack when desired.

The ends of the nut and of a box permanently secured in the sliding bar are inclined in the directions shown, the box, moreover, carrying a concave piece, *i*, which covers the end of the screw *k*, and is pressed forward by a helical spring. The cylindrical projection shown is made in one piece with the box *i*, and passes through the back end of the piece *h*. By turning the screw *k* to the left, the nut *g* is carried to the back, and, meeting the inclined surface of the box previously referred to, is raised from the rack and allows the jaw *u* to slide in either direction with perfect ease. A small plate, *n*, placed in the lower front end of the box *h* and operated by a spring, slips under the end of the nut when the latter is raised from the rack, and supports it until the inclines are separated, after which the nut drops and its teeth engage with those of the rack *t*. It will thus be seen that a short turn of the screw to the left will release the bar to slide, and another turn to the right will clamp the work. In order to operate the vise, the screw should be turned to the left until it stops; then slide the jaw to the desired point and turn the screw to the right to clamp the article. The screw should be turned back as far as it will go to slide the jaw.

The swivel, as shown, consists of two nuts traveling in a T-shaped annular recess in the base, and is clamped to the body by a pivoted lever bolt on each side of the vise. It can be operated quickly, holds firmly, and will be found very serviceable in many instances. As will be seen, the nut *g* is supported by the plate *n* above referred to, and the jaw *u* is free to slide. The lever bolt is designated by the letter *a*, and the traveling nuts by *e*. The vise is novel in many respects, and the manufacturers claim it to be strong, durable, quickly operated, and of great clamping power.

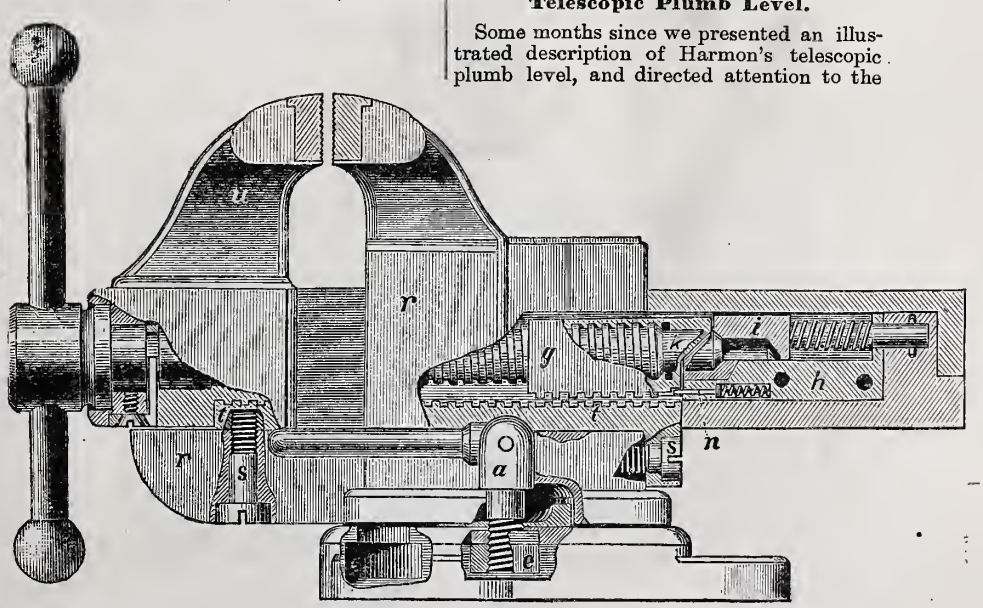
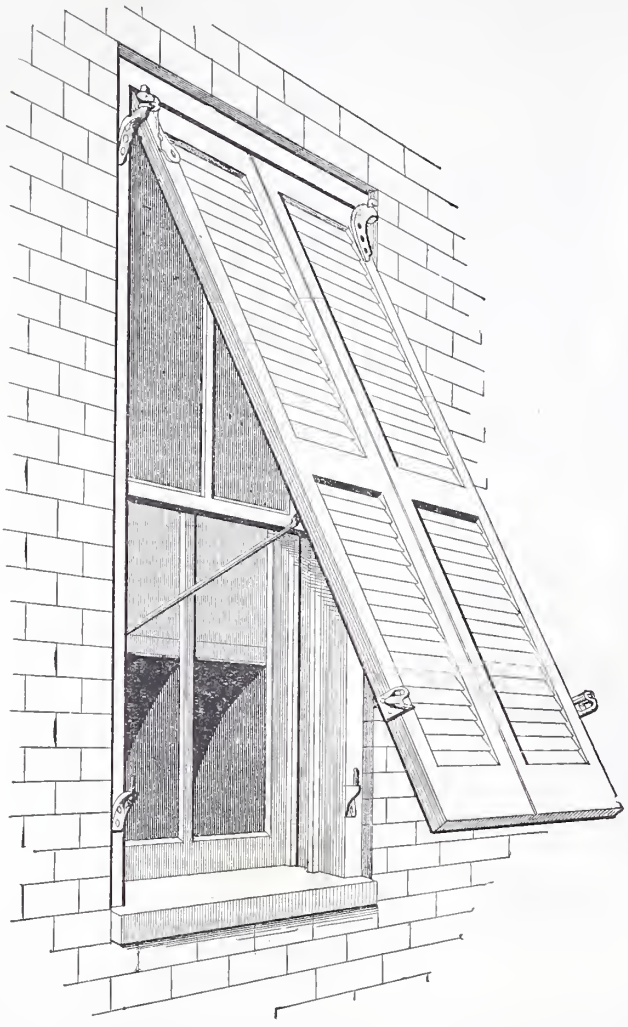



*Fig. 6.—Section and Elevation of Improved Vise, Manufactured by Read, Gleason & Read, Brooklyn, N. Y.*

### Telescopic Plumb Level.

Some months since we presented an illustrated description of Harmon's telescopic plumb level, and directed attention to the advantages appertaining to its use in leveling foundations and in doing other similar work about building construction. The instrument, as then described, was unmounted,

being adapted for use only in positions where it could be brought in close contact with the work examined. Under recent patents this instrument has been improved by the addition of a base of such a character as to admit of the use of legs, which thus fits it for field work. This improvement makes it applicable to many classes of work which formerly were beyond its range. A circular describing the improvement can be obtained by addressing Mr. John W. Harmon, 65 Haverhill street, Boston, Mass.



*Novelties.—Fig. 7.—View of Window Fitted with Automatic Blind Awning Fixtures.*

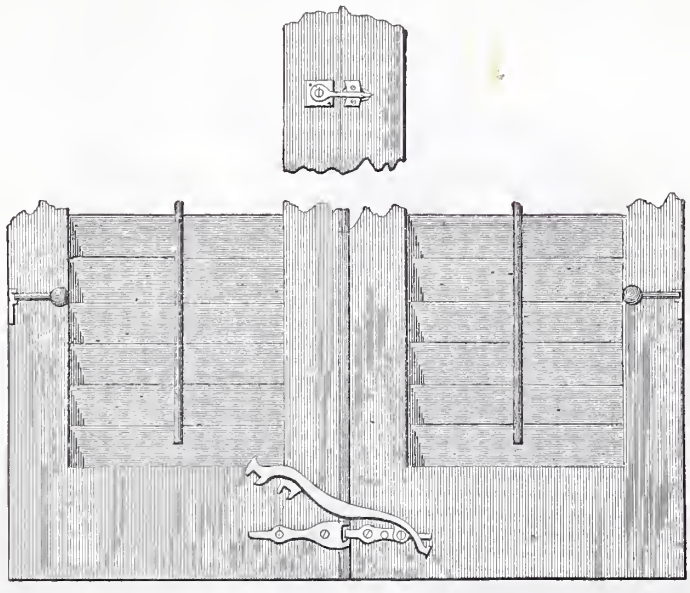


*Fig. 8.—Interior View of Shutters Closed, Showing Fastenings.*

### Blinds as Awnings.

The very extensive use of awnings over windows during the summer time, both in city and country, probably first suggested to the minds of inventors the desirability of arranging blind fixtures in such a manner that the blinds themselves could take the place of cloth awnings. Accordingly, at various exhibitions for several years past samples of blinds hung in such a manner as to open outward in the usual manner, or to swing from the top in one piece, have been shown. It is hardly necessary to occupy space with a narration of the advantages attending this form of construction. The utility is so obvious that it will be appreciated by every builder who has his attention directed to it. The Automatic Blind Awning Company—Messrs. F. O. North & Co., 276 Devonshire street, Boston, Mass.—are placing upon the market fixtures for adjusting blinds in this way which are of special interest to builders. The way these fixtures are employed and their operation are clearly shown by Figs. 7 to 10 of the engravings. In one view a blind, opened by being swung from the top, is shown, while another shows the fastening by which the two halves of the blind are held together in the inside in order to swing it in this manner. Two detailed views show the construction of upper and lower hinges by which these features are obtained. The construction is such that there is no difficulty in swinging a blind open in the usual manner,

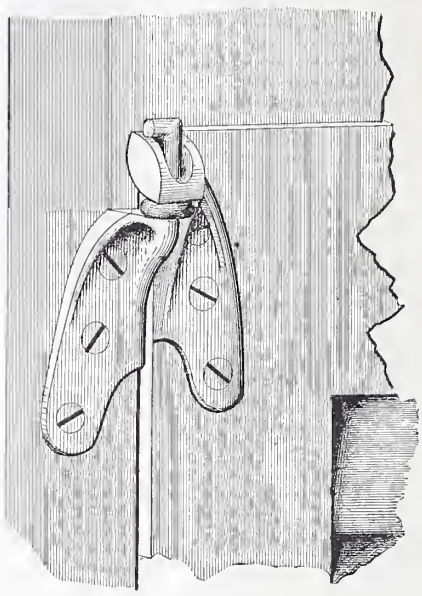


*Fig. 9.—Detail of Upper Hinge.*

while it may be fastened with entire security when used as an awning. The inside fastening is of such a character that by its means the blinds may be swung partially open and fastened together in this position. By means of different staples in the side of the window the blind may be swung out in the position shown in Fig. 7, or less, according to wish. Two different kinds of fastenings are made by this company, one adapted for shutters that close into the frame and as shown in Fig. 7, and the other adapted to those which shut on to the outside of the frame as they are sometimes constructed.

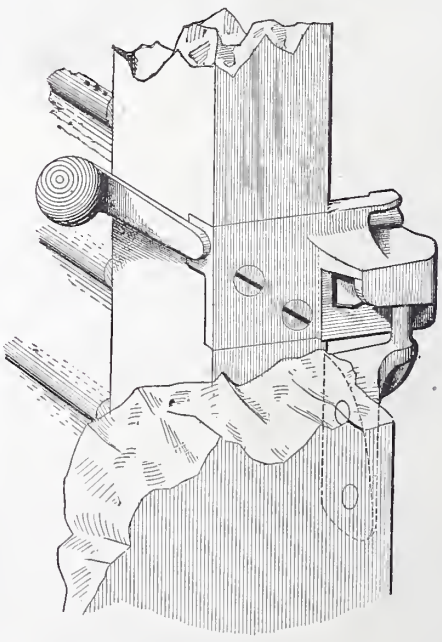


*Fig. 10.—Detail of Lower Hinge, Showing Small Crank by which the Parts are Disconnected so as to Allow the Shutter to Swing Outward.*

## CORRESPONDENCE.

We desire to direct particular attention to the extension of time on the Estimate Competition, particulars concerning which will be found in the advertising pages of this issue. Some considerations which prompt the renewal of this contest will be found in another column. From the fact that a very limited number took part in this competition as first advertised, it seems probable that it escaped the attention of many of our readers who are able to undertake such work, and who, from their private letters to the Editor, are certainly interested in everything that looks toward system in this important part of the builder's work. In renewing the offer of prizes and extending time, therefore, we trust to enlist the efforts of a very large number of our readers, and to make the competition a success, not only in obtaining such specimen estimates as are worthy of prizes, but in obtaining such a variety of schedules as will make a comparison of the work of different men side by side of the greatest value to the trade at large.

Some time since a correspondent asked several questions concerning the characteristics of building in the West Indies and in other sections of the world where the element of frost is not present. We refer this correspondent to the Editor' description of house building in Bermuda, which will be found in another portion of this number, as partially answering the questions raised.

We invite our readers' most careful scrutiny to the 15 sets of house plans presented in this issue, being the selected number from the efforts submitted in the Tenth Competition. A blank ballot for voting will be found in our advertising pages, and every one who reads the paper is entitled to a vote. We trust that all will improve the opportunity for indicating their preferences as to the planning of a seven-room house.

A number of interesting features, for which we are indebted to correspondents, are crowded out from this number for lack of room. We take this occasion to again remind contributors that we publish as fast as space will permit, always keeping in mind that a judicious selection of the material in hand is necessary in order to make an interesting and valuable paper. We dislike very much to disappoint any one who favors us with a contribution, and who must be discouraged at failing to see it in print promptly, but with the limited space at our command, and our large circle of readers and correspondents, it is impossible to pursue any other course satisfactorily than the one indicated. We ask the kind indulgence of all who fail to see their contributions appear as promptly as they think they should.

A prominent feature of our advertising pages in the past has been selected lists of books for architects, carpenters and builders. In the process of answering questions and looking up books on special subjects, and in answering questions of our correspondents, we have accumulated a list of books which are of exceptional value to all who are in the habit of studying the literature of their trade. Various portions of this list have at times been published in our advertising pages, and some months since they were gathered in the form of a small pamphlet entitled "What Books to Buy." Although we published a very large edition of this catalogue it has long since been exhausted, while the material has been constantly increased in our hands. We have lately published a new edition of this work, enlarged and improved. It is an octavo in size, and consists of 44 pages of clear type. The books are classified under the general subjects of which they treat. Under each title a succinct description of the book, its size, illustrations, binding and price, together with our opinion of its usefulness, is presented. This pamphlet will be sent to any address upon application. Those who do not find within its pages just what they want in the way of information about books are invited to address their inquiries to us direct. We are always ready to serve our subscribers in this manner.

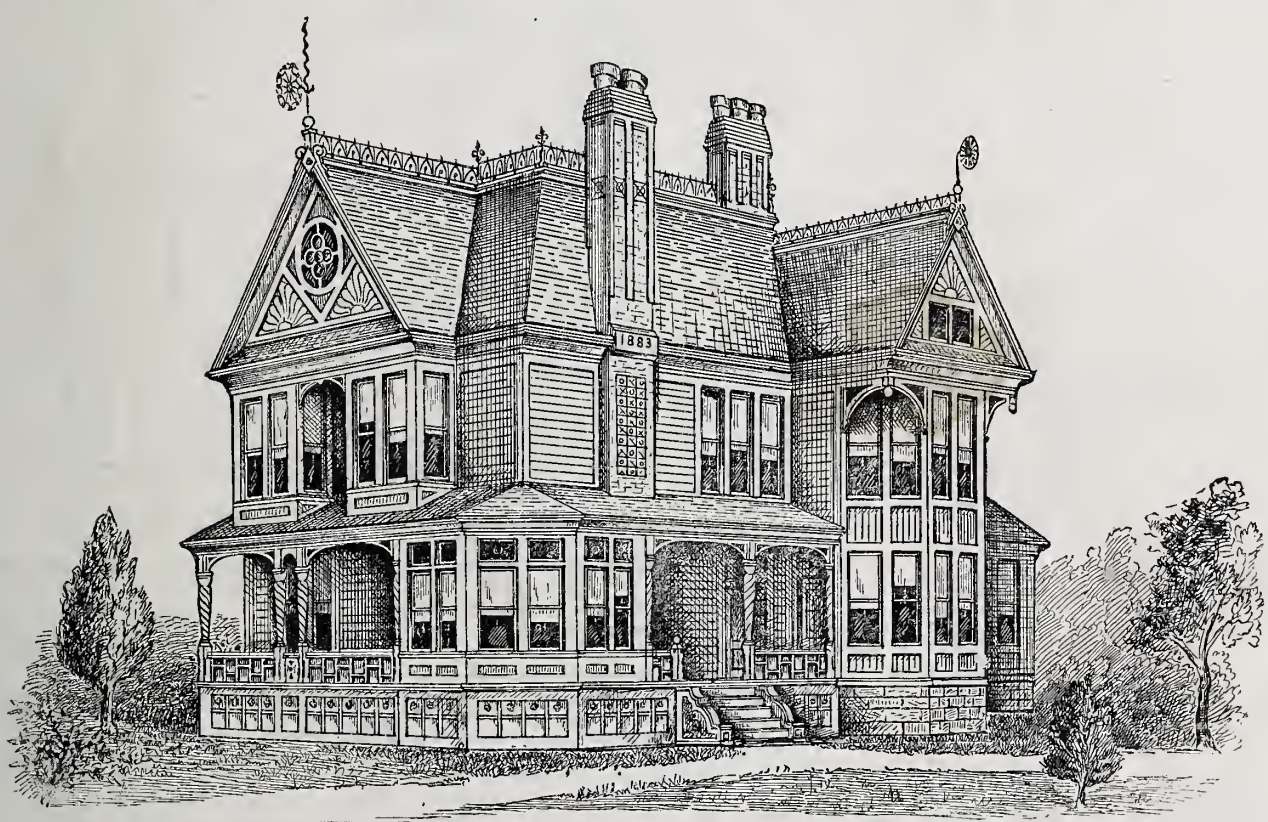
### Approximate Ellipses.

*From* J. P. F., *Chilton, Wis.*—Can an ellipse be constructed with the compasses that will stand the test of the trammel?

*Answer.*—Elliptical figures can be constructed by the compasses, varying in accuracy somewhat with the number of centers employed. These figures, however, are only approximately correct, and however carefully they may be constructed, their inaccuracy will be revealed if a line struck by an accurate trammel be compared with them. The principle upon which these approximate figures are constructed is that of arcs of circles of varying radii joined together. The line of a true ellipse may be described as a curve generated from a moving center; accordingly, one has breaks or angles, while the other is regular in its course. On small figures using from three to five centers the difference is almost inappreciable, and for almost all practical purposes in mechanics the approximate figure is all that can be desired. Answering our correspondent's question direct, we do not think an elliptical figure can be constructed with compasses, the inaccuracy of which could not be detected by properly constructed trammels.

### A Woman's House Plans.

*From* C. N. C., *Alpena, Mich.*—I have been a subscriber to *Carpentry and Building* since its first issue, and have often thought I would contribute something to its pages. The February issue, I believe, contained the first communication from a lady's pen that has ever graced its columns, and after perusing the article, I immediately decided to make a perspective view adapted to the floor plans published by Mrs. L. S. H., which




*Perspective View of Dwelling to "A Woman's House Plans," Published in Last Issue, Drawn by C. N. C., Alpena, Mich.*

I send you. If the Editor considers it of sufficient merit I shall be pleased to see it published in reply to her request. I have given a plain finish, as requested, and one that will be cheap in construction. I should like to have made some slight alteration in and additions to the plans, for the purpose of improving the external appearance of the building, but have adhered strictly to the floor plans given. While there are some things in the arrangement of the house that I should seriously object to, it undoubtedly suits Mrs. L. S. H., and that is all that is necessary. In my own practice I always consider the opinion of my client's wife of the first importance as to the internal arrangement of the building, and while I have to give up a great many times pet ideas of my own, I also receive many valuable suggestions from the ladies. I hope that other readers of the paper will contribute to the correspondence department.

### Number of Nails to the Pound.

*From* J. C. R., *Mount Vernon, N. Y.*—G. S. A., in the January number gives a "rule" for determining the number of nails to the pound. He says, "for all sizes between 6d. and 60d. the rule works well." Let us examine it, for it not unfrequently occurs that knowledge in this regard is desirable.

I have consulted four authorities, and find their extreme estimates to be as follow?

| | | | | | |
|---|---|---|---|---|---|
| 6d. | 156 to 167 | average | 162. | By G. S. A.'s rule, | 100 |
| 8d, | 94 to 101 | " | 98. | " | 75 |
| 10d, | 66 to 68 | " | 67. | " | 60 |
| 12d, | 50 to 54 | " | 52. | " | 50 |
| 20d, | 32 to 34 | " | 33. | " | 30 |
| 40d, | 25 to 28 | " | 27. | " | 15 |

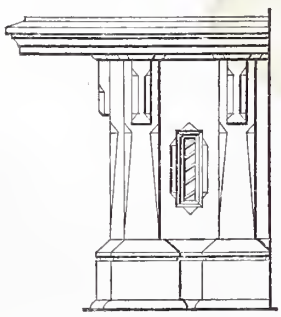
From which it appears that the "rule" answers only for one size, and but approximately at that. And that one is easily remembered, thus: a pound of 12 penny nails will last for 12 months if you use but one a week.

### Design for Store Fixtures.

*From* L. R. J., *Holton, Kan.*—I inclose herewith designs for counters and shelving, in answer to requests made by several correspondents. The work indicated should be made mostly of hard pine, finished in oil and varnish. The features of design and construction are so clearly shown in the drawings that I think further description is hardly necessary.

### Method of Writing Feet and Inches.

*From* H. S. E., *Albany, N. Y.*—The method of writing feet and inches was mentioned in *Carpentry and Building* for July, 1882. It was there stated that the common usage among architects was to write feet and inches thus: 4′ 3″ for 4 feet 3 inches. This subject was again brought to my notice in the specification by "Star," published in the issue of October, 1882. In that paper, on page 177, feet and inches were written thus: "3 feet 6 inches;" and, again, "1.6



*Design for Store Fixtures.—Fig. 1.—End of Counter.*

x 4.6." This last is quite confusing, expressing, as it does, feet and tenths, while the writer evidently intended feet and inches. His first method, "3 feet 6 inches," is correct, but it seems to me requires too much space. The best way to write feet and inches is as first mentioned above, only the feet and inches should be separated. It is sometimes the practice to separate them with a decimal point, thus: 4′.6″. A still better way, however, is to separate the figures with a dash, thus: 4′–6″. By taking care to make the figures, the prime marks and the dash distinctly, there will be no doubt as to what is meant by the expression. Another point in this connection may not be out of place. It is a common practice to write inches of any number as inches only; thus, 20 inches is written 20″. A much better rule is to always write inches requiring two figures to express them as feet and inches; thus 20 inches should be written 1′–8″.

*Note.*—The method of writing feet and inches is one of considerable importance in the preparation of specifications and in the figuring of drawings. It seems to us, judging at least from experience in both editorial work and in the preparation of drawings, that no one plan is adequate for all the occasions that arise. In a written specification we give preference to feet and inches written out in full. In a carefully figured drawing we like to see feet and inches indicated by the prime marks, as advocated by this correspondent. However, we have seen so many mistakes made by this means of writing feet and inches that we have been led in many cases to substitute feet and inches spelled out or abbreviated to "ft." and "in." The remark that our correspondent makes in closing, that such a quantity as 20 inches should be expresed as 1 foot 8 inches, is just, when viewed from a certain standpoint. However, common custom sanctions the expression 20 inches. Very frequently in conversation such terms are employed. The width of a table or counter would be more frequently given as 30 inches than 2 feet 6 inches. As long as expressions of this kind are sanctioned in conversation, the method of writing the quantities must be somewhat in accordance with it. We do not think our correspondent means what he says when he advises that all quantities of inches requiring two figures to express them should be given as feet and inches. He forgets that 10 and 11 are quantities requiring two figures for their expression, and that they are each of them less than a foot. If our readers have anything to say upon this subject we shall be glad to hear from them.

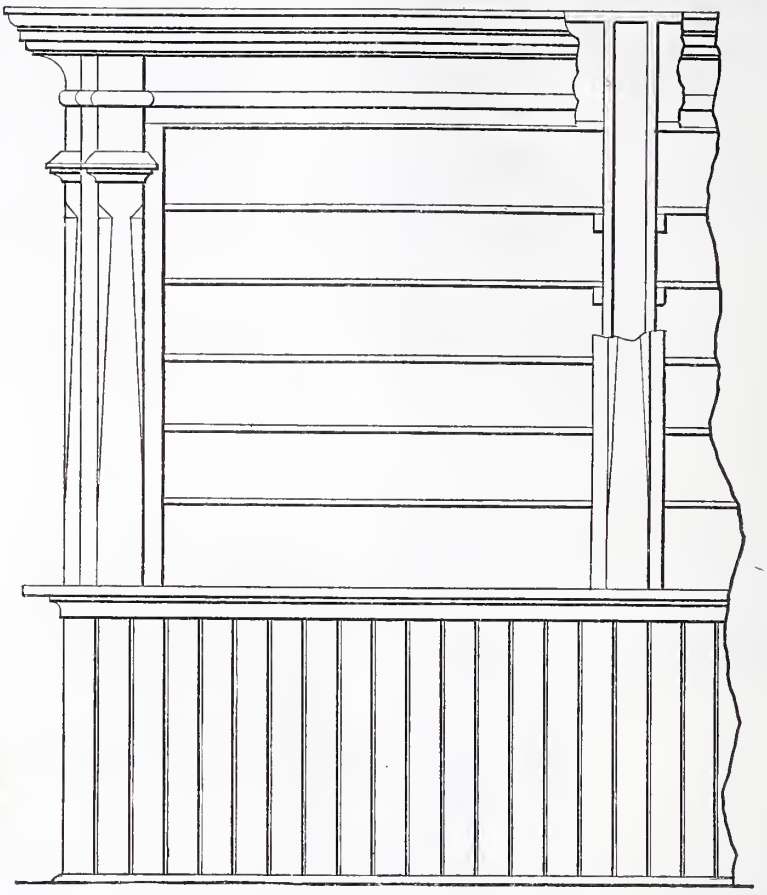
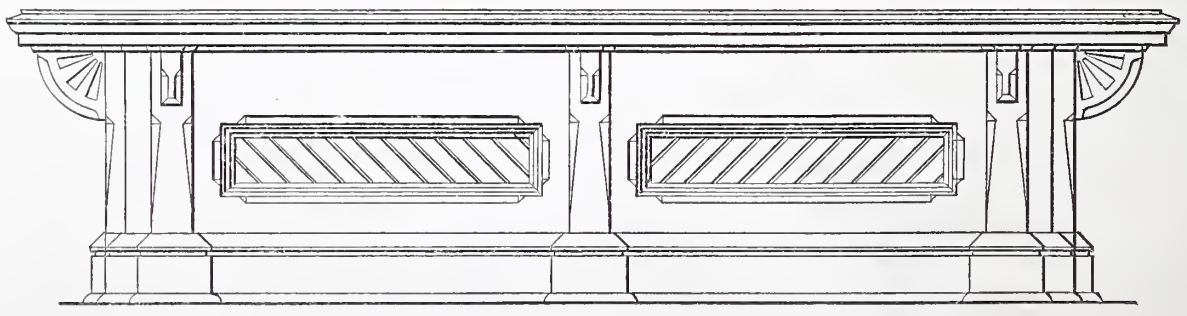


*Fig. 3.—Elevation of Shelving.—Scale ½ Inch to the Foot.*

### Making a Grocery Ice Box.

*From* A. & B., *Utica, N. Y.*—We would like some information in regard to the best method of making a chest ice-box suitable for a grocery store—one in which cold air will circulate inside. Any information bearing on the subject will be welcome.

*Answer.*—A good many of our readers have, within the past two or three years, built ice-chests and ice-boxes, and we should be very glad if they would give us any information which will be useful to our friends. We may, however, give a few hints which will be valuable in deciding upon the general plan of the box. The first thing is to get the inside box arranged so that the ice and provisions can be conveniently disposed of and easily reached. Arrangements must be made then for making the box tight. The next important point is how the escape of heat shall be prevented. The very best plan would be to cover the whole box with thick hair felt and then put on an outside box, which should be as nearly air-tight as it is possible to make it, leaving openings either at the



*Design for Store Fixtures, Contributed by L. R. J.—Fig. 2.—Elevation of Counter.—Scale, ½ Inch to the Foot.*

jambs of the doors or at the top or bottom. Next to hair felt, probably the cheapest and best material is mineral wool. To use this a space at the top, bottom and sides of the box should be made into which the wool can be packed, and when all the space is

*Design for Store Fixtures.—Fig. 4.—End of Shelving.*

filled, the openings should be closed, so that the wool is cut off from all contact with the external air. There ought to be drainage openings, and in making these care should be taken not to allow any dampness to get into the filling space. The doors ought to be double, and the same precautions taken with them as with the walls. The mineral

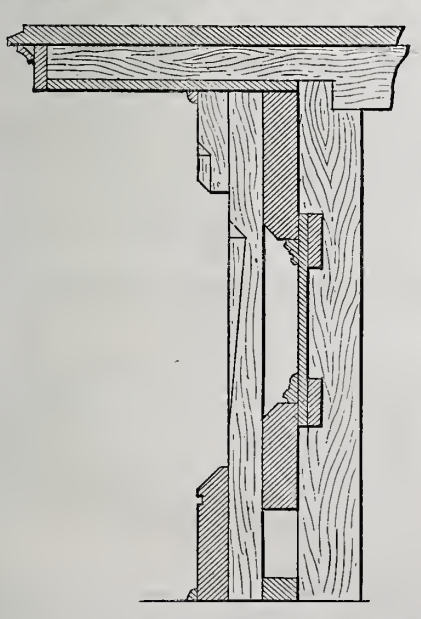


*Fig. 5.—Section Through Counter.—Scale 1 Inch to the Foot.*

wool or felt with which they are filled should be cut off from the external air. The most successful ice-boxes ever made were those built by a firm in New York, whose name we have now forgotten. They allowed a few small openings for fresh air to enter the ice-box or refrigerator, and then by means of a flue, in which a lamp was kept constantly burning, they created an outward draft, and so caused a constant current of air to flow through the box. If we remember rightly, the quantity of ice which was necessary for these boxes was exceedingly small. A part of this economy, we presume, was due to the fact that they used nothing but hair felt, something like 2 inches, in covering their boxes. Our friends will see that these are merely general remarks, and we are sorry we cannot give them something more definite. Our readers, however, will doubtless come to the rescue shortly.

### A Study in Suburban Architecture.

*From* ANOTHER ARCHITECT, *Birmingham, Conn.*—Considerable interest was awakened in my mind at the commencement of the series of papers on "A Study in Suburban Architecture," now being published in your journal, as being likely to give me many valuable hints as to the manner in which one of my professional brethren overcomes some of the many problems connected with the successful planning and locating of a house. Especially did I look forward eagerly, as an architect who essays to plan a house in print for the benefit of intending builders must have had a large amount of experience heretofore, particularly when he ventures to bring the proposed house under the head of "Architects' Homes," which are supposed by the general public to be the very *ne plus ultra* of utility, beauty and all other desirable architectural qualities. So few papers have already been issued that it is perhaps unfair to criticise at this stage; still, the author appears to have gone so far in his undertaking as to have adopted an arrangement for cellar and floors, for location on the lot, and, with perhaps a few mental reservations, for the elevations. As the design of the article seems to be to assist the general building public, and as there are so many apparently ill-advised arrangements, I venture to call the attention of "Mr. Archie" to a few of them.

To begin with, one of the fundamental rules in the practice of an architect is to have a reason for everything. If he designs a quaint bit of work for an exterior, it should be because it is to convey a certain impression to the mind through the eye; and if he adopts a certain disposition of rooms, it should be because of this or that reason. Therefore, we were a good deal surprised that, when "Mrs. Archie" proceeded with the greatest complacency to knock the preliminary studies all to pieces, her obedient spouse had no reasons—valid or otherwise—as to why he had chosen the various arrangements shown; or, if he did have such reasons, he didn't venture to suggest them. So much for first impressions. In proceeding, let us first consider the house with reference to its general location and surroundings, and then the arrangements of rooms, &c. Even if the author had not so stated, we should at once infer, from the size and disposition of lot, as shown in Fig. 5, that the location was in a suburban village He also indicates by the barn and stable-yard that he intends to keep one or more horses. Now, what is a stable-yard in a suburban village? It is a place where all stable refuse is thrown, where the fowls are kept, and where most likely will be one or two pigs for making away with house refuse, for it is hardly probable that the suburban village will have its city garbage service. Again, the proprietor of a house of the pretentions of the one in question will in all probability be possessed of considerable of this world's goods and will feel somewhat independent. Therefore, being aware of the iniquities practiced by the "fresh-country-milk man," he naturally will wish to keep a cow to supply his own table; and, if so, said cow will have to be one of the occupants of the yard a part of the time at least. All things considered, then, what a delightful situation for a pavilion or summer-house, even though protected by the all-sufficient lattice? Should any one be so squeamish as to dislike the odor on that side, he could turn to the other, where he will be within 12 or 15 inches of the pipe, redolent with odors strongly suggestive of "Mrs. Miller's second-best," at which Bob or Mike or Tom pulls away so industriously as he goes up or down Station street. He will also be enabled to take in the dulcet tones and harmonious expressions of occasional draymen going to and from the station. The old idea that a summer-house should be filled with the sweet odors of surrounding shrubbery and screened from prying eyes is exploded. Much more inspiration may be obtained from a favorite author when perused within 6 or 8 inches of the sidewalk, and within sight and sound of a busy railroad with its clattering trains. Then, too, "help" are human—not to say occasionally as respectable as their employers—and might object to being made to come in through the stable-yard. Nor are pedestrians going to the front door apt to be in the best of humor when they get there, for having been obliged to traverse some 25 or 30 feet of carriage road. Is the *porte cochère* an unknown quantity with Mr. Archie, that he should bring his carriageway, with its inevitable gravel, dust or mud, directly up to the front door of his house?

Now, let us look at the house for a moment, beginning at the bottom. The first thing we notice is that the furnaces are entirely separate from the coal supply and ash receptacle, thereby entailing much needless labor, and, we fear, a good deal of "cussing." Then the carts bringing coal would necessarily be driven across quite a stretch of presumably grassy lawn, in plain sight from Thoroughfare street. Why not provide for a furnace and coal bin in the northeast corner? Then an entrance for the coal carts could be arranged through the stable-yard, notwithstanding the difference in levels.

On the main floor the hall is not well lighted, Mr. Archie to the contrary notwithstanding, and does not contain a single window commanding a direct view of front porch or entrance walk. In fact, there is not a single room on the main floor (with the exception of the kitchen) from the windows of which one can obtain a direct view of Thoroughfare street. Where is the use of the porch and steps on the south side, with no door from either room and no path across the lawn? Does Mr. A. expect to use the window as a common mode of egress and ingress? And does he expect to "cut across lots" each time between the steps and the gate? We fear that kitchen entry would be anything but a savory place when the servants had used it a few times after coming through the stable-yard.

In the second story, the hall is even more poorly lighted than below, there being but one window (and that not full size) above the floor level. The general linen closet, too, should be placed where access to it can be had without going through any of the rooms, and the superabundance of alcoves and short corridors opening to the various rooms makes the general plan so intricate as to almost require the legend, "To the exit," in conspicuous places. These are not all the noticeable faults; but we fear too much valuable space has already been taken. If so, we crave forgiveness. Probably Mr. Archie will be less diffident in replying to our objections than to those of Mrs. Archie.

### Wet Lath for Plastering.

*From* C. S. B., *Cleveland, Ohio.*—In the January number of *Carpentry and Building*, S. K. F., of Camden, N. J., asserts that wet lath are better than dry ones for plastering. His reason for this is that if a plasterer undertakes a repair job on old lath he commences by wetting them. Now, the plasterer does this on account of the dust adhering to the lath. Wetting them removes it. Mortar will adhere better on a smooth surface than on a rough one.

### Cracking of Plaster.

*From* C. S. B., *Cleveland, Ohio.*—I agree with E. M. H. in regard to plaster cracking. I had a job done on green walls—that is, a thin coat of mortar put on, then a heavy coat, and darbied up ready for the last coat. I did not want the work done in that manner, but the owner said he was willing it should be done that way. The result was that when it became dry it was cracked very badly. Whether the old plan be con-

sidered an exploded idea or not, for my part I am convinced that it is the only way in which the work should be done.

## REFERRED TO OUR READERS.

### Wood and Paper Ceilings.

*From* T. S., *Medina, N. Y.*—Will some reader of *Carpentry and Building* be kind enough to furnish designs for wood and paper combined ceilings? I want something suitable for a ceiling 12 x 24 feet.

### Rustic Arbors.

*From* J. H. A., *Wilkesbarre, Pa.*—Will some of the readers of *Carpentry and Building* furnish plans and elevations of rustic arbors and summer houses with stationary seats? I desire something the roof of which shall be water-tight, but which has a "rustic" appearance.

### Design for a Church.

*From* E. W. K., *Coote's Store, Va.*—I would be glad if some of the practical readers of the paper would furnish a design for a small country church. It should be about 36 x 26 feet in plan, with ceiling 14 feet above the floor, and constructed with truss roof. I would like the plan with seats and aisles, with a design for a pulpit appropriate for the purpose. Also a plan for an 8 x 10 vestibule, which, continued upward, shall form a belfry. I would also like a design for a roof truss. If some reader of the paper, in addition to the above, would also give a bill of the timber, he would confer a still further favor. The church that I have in mind is to be finished by wainscoting up to the windows, and by plastering above that line.

### Palmer's Patent Planes.

*From* J. C. R., *Bangor, Me.*—I very much want to find out where Palmer's patent iron bench planes are made. They were formerly manufactured at Auburn, N. Y. If some one will advertise them, or forward the information in answer to this question, they will confer a favor upon me, as well as other readers of the paper.

### Strains in a Howe Truss.

*From* D., *Philadelphia.*—Will some of your readers give me a simple method by which to find the strains in the different members of a Howe truss, without much calculation or the use of complicated algebraic formulæ. Trautwine gives some rules on the subject, but I can't quite make them out. It seems one would have to read nearly the whole of his book to find out just what he means.

### Figuring on Contract Work.

*From* W. C. S., *Oregon.*—It seems to me that practical men in the trade can give some hints as to the best and safest methods of figuring on contract work in the building line. If communications of this kind could be secured, and space in *Carpentry and Building* devoted to their publication, I think service would be done to the trade at large.

### Barb Nails for Tin Roofing.

*From* W. C. B., *Canastota, N. Y.*—I wish to inquire, through the columns of *Carpentry and Building*, if there is any firm that manufacture barb nails suitable for tin-roofing purposes.

### Information Desired.

*From* W. E. S., *Meaford, Ontario.*—There are several things I want to ask. In the December number, F. S. W. says: "Underneath the rafters I nailed on a 6-inch fencing strip, forming a truss, as shown in the drawing." What does he mean? I like his glue joint, and am rather struck with the views of J. A. E., of Tracy City, Pa., on roofs and pitches. I would like to know how G. B. Randall, of Chicago, is to nail, according to the drawing, the two members B B to his string-piece C, the inclined ties D D, the horizontal tie E and the rafters at the top, when his rafters are 2x8, the string-piece C 2x8, the ties D D 4x8, and the tie E 2x8. I do not ask these questions in a critical spirit, but with a desire for information, and I hope the gentlemen will reply.

### Interior Finish.

*From* C. E. W., *Lancaster, Pa.*—I should like to have some of the readers of *Carpentry and Building* enlighten me upon a few points concerning interior finish. Is the soffit under the stairway always considered a part of the ceiling or sides of a room? Is it governed by any pitch or angle? For instance, if the soffit should be at an angle of 45°, or 30°, or 20° from the side wall, what should it be considered in that case—wall or ceiling? Also, with a hip or mansard roof, how would you discriminate when it had a slight pitch or a greater one?

### Window Fastenings.

*From* S. P. G., *San Antonio, Tex.*—I desire to inquire if there is any better device for use in connection with common window frames than the automatic window support or sash balance for raising and lowering sash. If any readers of the paper are acquainted with a better article for the purpose, it will be of interest to many to have a description of it, with particulars where it can be obtained.

### Mortar for Plastering.

*From* A. M. B., *South Canaan, Conn.*—Will some practical reader of the paper give me directions as to the proper way of mixing mortar for plastering? I desire to know the best proportions of ingredients and the method of putting in the hair. In a recent number of *Carpentry and Building* the statement was made that it was advantageous to mortar to stand for some time before using. Masons in this vicinity say that, if allowed to stand, the hair will be eaten up. They also assert that the proper time for putting in the hair is when the lime is slaking. I desire to know the opinion of practical readers of the paper on these points.

### Stabling for Cattle.

*From* G. R. M., *Camden, N. J.*—I would like to ask of the readers of *Carpentry and Building* the best mode of stabling cattle, together with plans of the buildings, and general features of construction. Carpenters are frequently called upon to perform work of this kind, and, accordingly, a discussion of it in the columns of *Carpentry and Building* would be generally acceptable.

### Deadening Floors.

*From* W. R., *Chatham, Ont.*—In building the second floor of a schoolhouse, the ceiling on the under side of the joist is of 1-inch matched pines. The floor is also of 1-inch matched stuff, with a 2 x 4 inch furring set on edge for ventilation flues. Over this is laid a 2-inch floor for the schoolroom. By this construction there are two air spaces and three matched floors. I desire to ask if this construction is not enough in itself for deadening the sound, or would some device for deafening still be required? How would this construction compare with the usual plan—say a 2-inch floor on the joist, a plaster ceiling underneath and deafened with a course of mortar 1 inch thick on a rough floor between the joist? If some of the practical readers of *Carpentry and Building* will answer these questions they will confer a favor.

### Coloring Plaster.

*From* J. P. D. *Atlantic Highlands, N. J.*—I desire to learn through *Carpentry and Building* what kind of coloring matter may be used, and in what proportions; also how to slake lime that is to receive the coloring, and at what stage in the process of putty lime slaking the coloring should be introduced in order to produce tinted walls. Any useful details of the operation will also be of value. I have two rooms that are to be finished with color in the hard coat, and I am very anxious to turn off a creditable job. If the practical readers of *Carpentry and Building* can help me in this matter it will be a special favor.

## STRAY CHIPS.

Buildings valued at $200,000 were erected in Alpena, Mich., during the year ended January 1, 1883.

At Indianapolis, Ind., the Young Men's Christian Association propose erecting a new building that will cost, when completed, in the neighborhood of $20,000.

The contract for the steam-heating work for the Young Men's Christian Association building in Buffalo, N. Y., has been let to Messrs. Erlhacker & Davis, and the plumbing work to Mr. John D. Smith, for the sums of $5600 and $1900 respectively.

Mr. Samuel Kuhn has filed plans with the Bureau of Buildings for four 3-story brick dwelling houses to be put up on Richmond street, between Cutler and Linn, in Cincinnati, Ohio. The cost is estimated at $20,000. The architect who prepared the plans was Mr. Samuel Hannaford, of that city.

A new hotel is among the projects for the new year in St. Louis. It is to be located on Pine st., near Ninth. The owner and proprietor is Mr. Leo Moser, who has long conducted a popular restaurant in that vicinity. The estimated cost is $35,000. Work will begin as soon as the weather will permit.

Mr. Charles L. Carson, architect, of Baltimore, Md., has just completed the drawings for a five-story and basement warehouse to be erected on Lombard street, in that city, for a Mr. Howard. The structure will be 35 x 170 feet, built of brick, with stone and terra-cotta finish. The estimated cost is $30,000.

The Missouri Historical Society and the Mercantile Library Association, both of St. Louis, are contemplating the early erection of a fireproof building for the joint accommodation of the two societies, each of which is greatly in want of additional room and of a safe depository for their large and valuable collections

Mr. R. S. Roeschlaub, architect, of Denver, Col., has lately prepared the plans for a 12-room school building to be erected in that city. Brick and stone will be used in its construction, and $45,000 is the estimated cost. The same architect has also completed plans for a private residence for Mr. Philip Feldhauser, Jr., the estimated cost of which is $7000.

Mr. M. Clements, of Cincinnati, has been awarded the contract, by the Illinois Central, St. Louis and Chicago Railroad Company, for an additional shed for the new depot building that the company are putting up in that city. The structure is 80 x 300 feet in dimensions, constructed of iron and provided with Rendle's patent skylights. The cost is estimated at $20,000.

Messrs. Cudell & Blumenthal are the architects of the Riding School building that is being erected on North Clark, between Goethe and Schiller streets, Chicago, Ill. The building will be 152 x 72 feet in size and two stories in hight. It will be constructed of pressed brick, with stone finish. The track in the interior will have facilities for the accommodation of 20 horses. The cost is estimated at $22,000.

The extensive malleable iron works of Duggan & Parkes, at St. Louis, were destroyed by fire on January 15, 1883. Origin of the fire unknown. Preparations were made at once for rebuilding. 100 men being set at work clearing the wreck These works will cover an acre of ground, and their payroll numbers 200 workmen. The new machine shop and office building will be 30 x 200. 2 stories high; the annealing shop will be 51 x 109; the molding shop, 50 x 186 and 50 x 76; the engine room, 40 x 90, and the usual offices, &c.

During the month of January of the present year there were issued only 21 building permits in the city of Denver, Col. Among the more important of these may be mentioned one for a three-story brick business block 50 x 124 feet in size for Mr. W. H. Lyon, costing $13,000; a two-story brick block of three dwellings 50 x 52 feet for Mr. J. H. Hart, costing $6000, and repairs and alterations of a block that will be used for business purposes, 50 x 122 feet in size, and costing $12,000. For the latter improvements Mr. E. P. Brink is the architect, and Messrs. Hallack & Howard the builders.

Messrs. Edbrooke & Burnham, architects, have prepared the plans for an apartment house to be erected on Warren avenue, opposite the Union Park, Chicago, Ill., for Mr E. S. Heaton. The building will be of pressed brick, with stone finish, three stories in hight, and will cost $12,000. The same architects have also finished the plans for a three-story private residence for Mr. L. A. Herrick, of the same city, that is to be erected at No. 2618 Prairie avenue. The structure will be in the Elizabethan style of architecture, 30 x 70 feet in plan, built of pressed brick, with stone finish. The cost is estimated at $16,000.

Within a few days after the burning of the Newhall House, in Milwaukee, and while the excitement caused by that event was unabated, the well-known Planters' House, of St. Louis, caught fire and narrowly escaped destruction. The fire started in the basement near the laundry, and, fortunately, remote from the elevator shaft. It was discovered about four o'clock in the morning. The guests were promptly aroused and removed from danger, and the fire department succeeded in arresting the flames without serious injury to the main building of the hotel. Three of the servants lost their lives, however. It is supposed that, in the confusion, they lost their way and were suffocated before their absence was discovered.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=APRIL, 1883. NUMBER 4

## A Study in Suburban Architecture.*

BY AN ARCHITECT.

### Details.

We are busy at present with details of the exterior finish of our house, as we shall very soon need them to go on with the work. While we have been giving our attention to the framing plans, and presenting a perspective view of the house, work on the cellar has been going on and the walls are nearly ready for the first floor.

Many a man builds a house and never knows the amount of drawings prepared by his architect. He takes great interest in the plans and elevations, and after the house has progressed far enough for interior detail, thinks considerably of the staircase, mantels and decorations, or is quite busy with the selection of tile to be introduced here and there, and is firmly resolved to have both handsome and substantial hardware; but if the drawings, which busy pencils have produced during the progress of building, were laid before him in a pile he would be surprised, and might not be so apt to demur to the payment of the percentage asked by his architect. Even architects themselves sometimes underrate the importance of full-size details, and put the contractor off with a few scale drawings and fewer full-size profiles and sections. If it should chance that the man who lays out the work from these scale drawings and enlarges the moldings to full size (as he must do before the same can be run through the machine) has more talent for designing moldings than the architect, then he may improve on them; if not, they will suffer perceptibly in the translation. In the former case he should have the credit of the design and the pay for his labor; in the latter, perhaps it would have been as well to have done without the architect entirely.

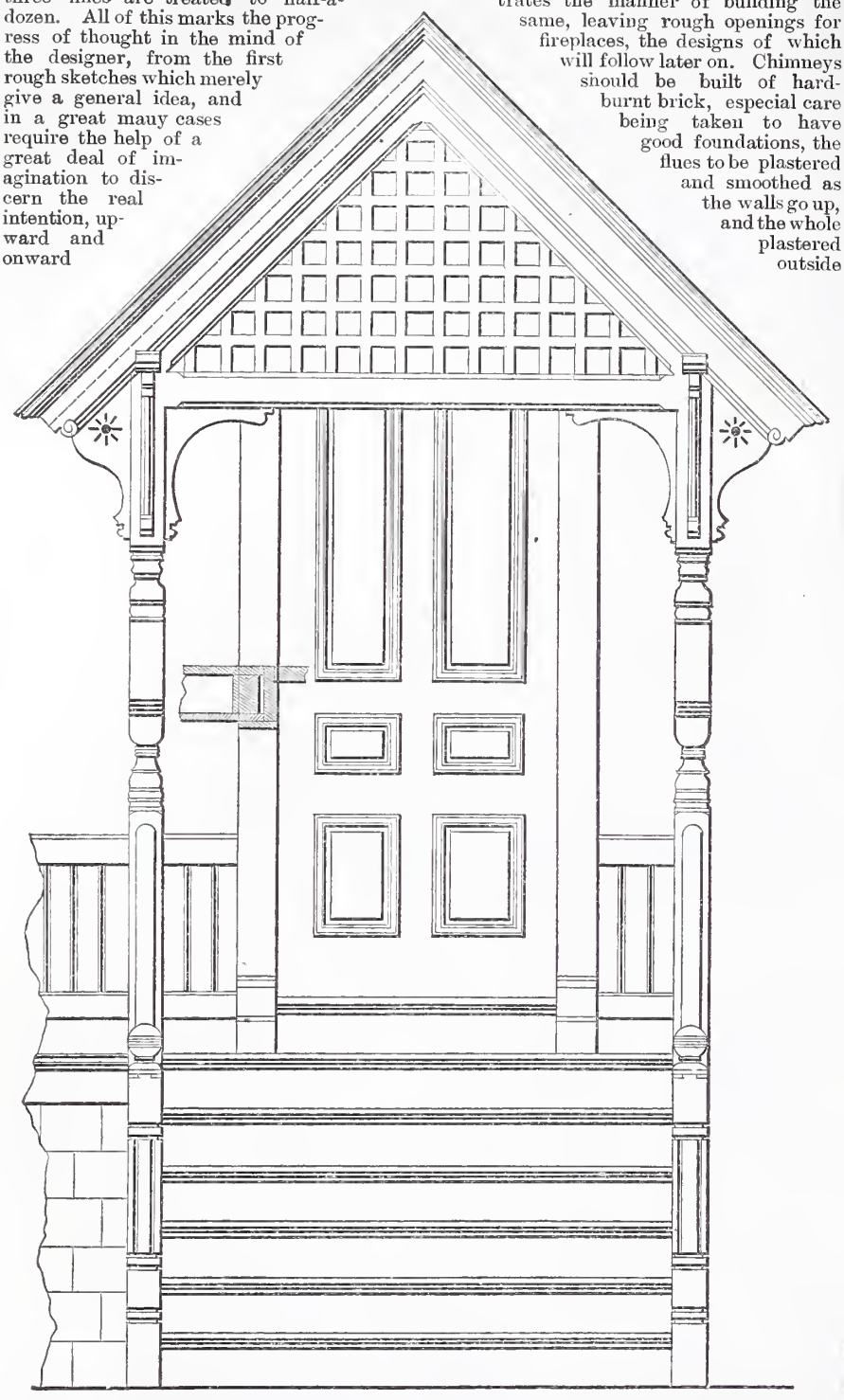
Full-size drawings are important also as methods of perfecting and refining the design, and never fail to point out something that is impracticable, which, although presenting a very interesting and pleasing form in the elevation, must be stricken out in the actual building. Hence the reason that the architects' drawings so often disagree. The first elevations, perhaps, show a cornice

A STUDY IN SUBURBAN ARCHITECTURE.--PERSPECTIVE VIEW OF SERVANTS' PORCH.

* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.

that scales 16 inches in projection, while the larger drawings are content with only 12, and the spaces that were occupied by two or three lines are treated to half-a-dozen. All of this marks the progress of thought in the mind of the designer, from the first rough sketches which merely give a general idea, and in a great many cases require the help of a great deal of imagination to discern the real intention, upward and onward

Speaking of chimneys reminds us that our detail-sheet contains the working drawings of one of the chimneys in our house, and illustrates the manner of building the same, leaving rough openings for fireplaces, the designs of which will follow later on. Chimneys should be built of hard-burnt brick, especial care being taken to have good foundations, the flues to be plastered and smoothed as the walls go up, and the whole plastered outside

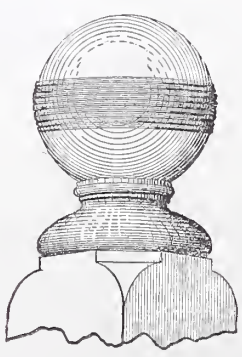


*Study in Suburban Architecture.—Elevation of Servants' Porch.—Scale, ½ Inch to the Foot.*

to the perfected whole. This would seem to be a reason why buildings that are intended to be works of art should not be built by contract, it being almost impossible to see from the beginning the amount of skilled labor that will have to be performed in order to reach the high goal that the first sketch has but dimly foreshadowed.

Mrs. Archie looks up from her work to ask why the designer sketches so much in perspective? If a perspective cannot be measured, of what use is it? It is true that a perspective drawing is of little use in the workshop, save as a hint of the way the finished work will look from a given point of view, and is often of help in that way. It is of great value to the designer, however, and should be understood and practiced by every one who pretends to design at all, for one can hardly be certain of the effect of his design, when executed, who has no knowledge of the laws of perspective and the effect they have upon the proportions of everything about a building, from foundation to chimney-top.

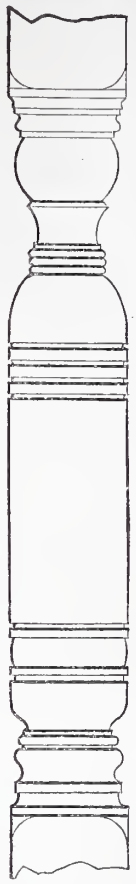
at completion. Various materials are used for the part that rises through the roof, but we



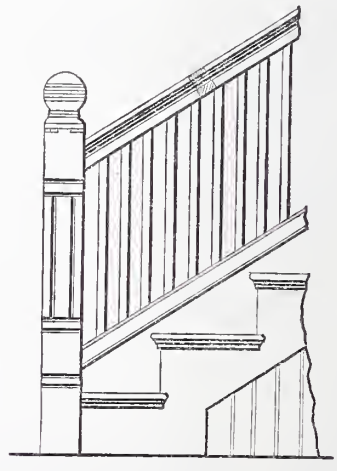
*Detail of Cap to Post, Servants' Porch.*

rarely see a better and more lasting effect for domestic architecture than good, dark-red faced brick, laid neatly in dark-red mortar.

Perhaps this is as favorable an opportunity as any to notice the critic whose letter appeared in the last issue. The "considerable" interest awakened in the mind of the architect of Birmingham was intensely reflected in our own, as the heading "A Study in Suburban Architecture" flashed upon us from the columns of correspondence. With a bounding heart we proceeded to possess ourselves of the points in this good-natured criticism. Especially eager and delighted were we, because it was the work of an architect. Now, thought we, here are some valuable hints as to the manner in which one of our professional brethren will swoop (kindly) down upon us. Here is a man who, with a large amount of experience at command (particularly as he has ventured to criticise one of his professional brethren), will surely give the subject an earnest, careful and straightforward rendering. We shall be praised a little and damned considerably. Oh, yes! we expected to be found in error, and did not for a moment indulge in the thought of an unqualified approval, for all architects are human. But we were surprised when "Another Architect" proceeded, with the utmost coolness and apparent deliberation, to find all manner of fault with our effort. He seemed to see nothing for approval, or, if he did, he forgot the customary courtesy indulged in by the reviewers—that of slurring with faint praise.



*Detail Post.—Scale, 1½ Ins. to Ft.*

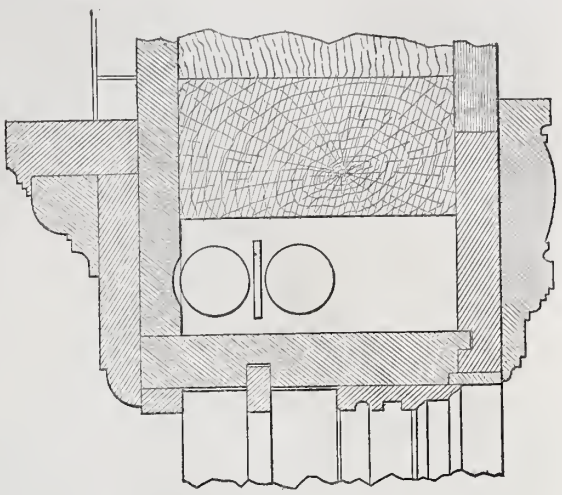


*Detail Foot of Stairs, Servants' Porch.*

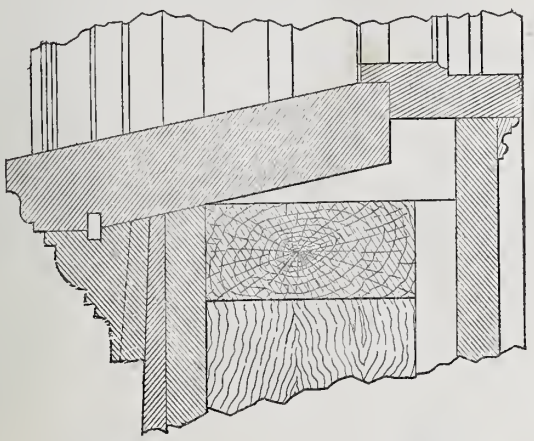
We heartily agree with our critic that one of the fundamental rules in the practice of architecture is "to have a reason for everything," and we hope he will agree with us that it is not one of the fundamental qualities of architects in general to make superhuman efforts to see what their professional brethren's reasons are, if they have any. It is not, therefore, so surprising, after all, that "Another Architect" should study the drawings without reading the text, and accordingly fall into an error in believing that Mr. Archie had adopted or chosen the arrangement of rooms shown in any of the plans illustrating the first paper. If the kindly critic will read up a little he will find that one of the plans was selected from Archie's portfolio as material for a beginning; that another was the result of study of the fore-

and sitting-room. Not once does Mr. Archie appear inclined to adopt any of the plans. He sees clearly that the best of them are not well arranged for the lot, and when afterward Mrs. Archie is made to explain why they are not, he is not anxious to make any one believe that they are, or to discuss the question of putting a good plan on the wrong site. He leaves it for "Another Architect" to wrestle with.

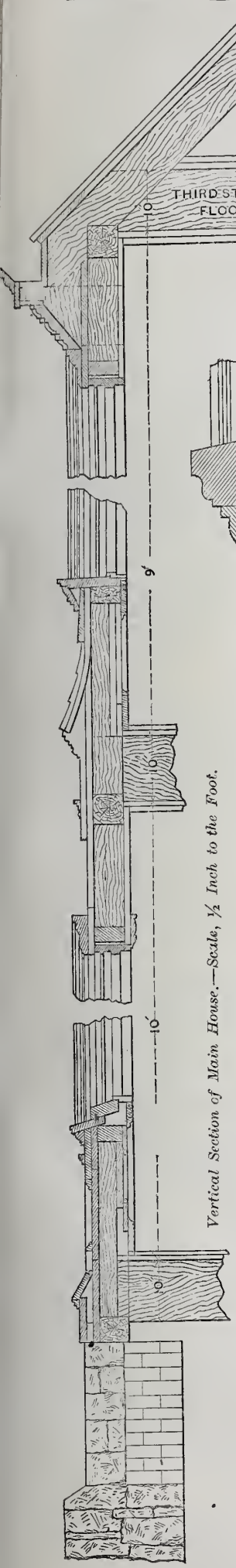
But our critic has started out with a wrong impression of our intention, and must follow that impression blindly to the end. Therefore, he must needs believe that Mr. Archie will leave his pent-up home in the city to keep a nuisance in the country; that his stable-yard will be the exact picture of the slatternly receptacle of refuse usually



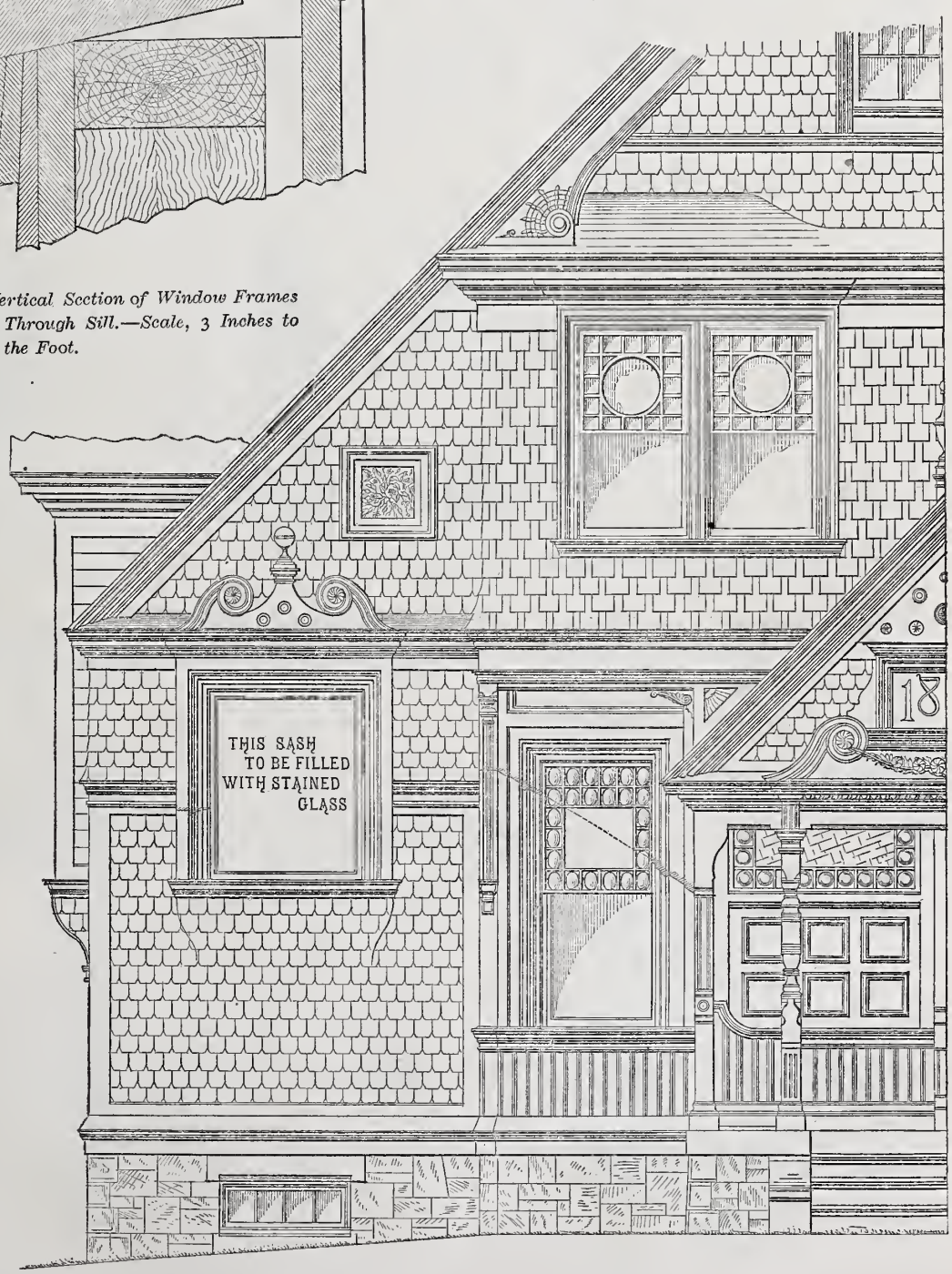
*Horizontal Section of Window Frames.—Scale, 3 Inches to the Foot.*



*Vertical Section of Window Frames Through Sill.—Scale, 3 Inches to the Foot.*




*Vertical Section of Main House.—Scale, ½ Inch to the Foot.*




*Study in Suburban Architecture.—Half Front Elevation.—Scale, ¼ Inch to the Foot.*

going; that another illustrated the effect of enlarging the hall in the preceding plan, and still another was a further modification, showing the reception hall between parlor seen by "Another Architect." This is not so. We are not farmers, and shall not build a farm barn on a 125 x 200 foot lot. Had our critic been indulgent, he might have imagined that one whom he believes a "possessor of considerable of this world's goods," and "feeling somewhat independent," could properly locate his dairy-farm still further in the

country, and require the products of his farm brought daily to him, not allowing the "fresh-country-milk man" to indulge in the iniquities that do not inebriate. In this way the odors from that side of the pavilion would be avoided. On the other side, the odor of the pipe that so strongly suggests "Mrs. Miller's second best" could hardly be within 12 or 15 inches of an occupant of the summer-house, unless "Bob, Mike or Tom" are in the habit of stalking up Station street on stilts. It having been stated in our first paper that the grade of Station street had a declination to to the east of about 2 feet in 50, we reasonably believe that our critic will accept our explanation that the fall of grade to the center of summer-house is not less than 6 feet 6 inches. Add to that the hight of curbing around lot at corner, which is 1 foot 6 inches, and to that the hight of the floor of summer-house from lawn, which is 2 feet, and he will have a total hight of 10 feet above grade of sidewalk. Now, as we do not intend to lie on the floor of the summer-house with our head under the seat and nose pressed to the lattice, we shall be undoubtedly so far removed from "Mrs. Miller's worst" as to be entirely indifferent as to the exact amount of industry that Bob, Mike or Tom are wasting on their pipes.

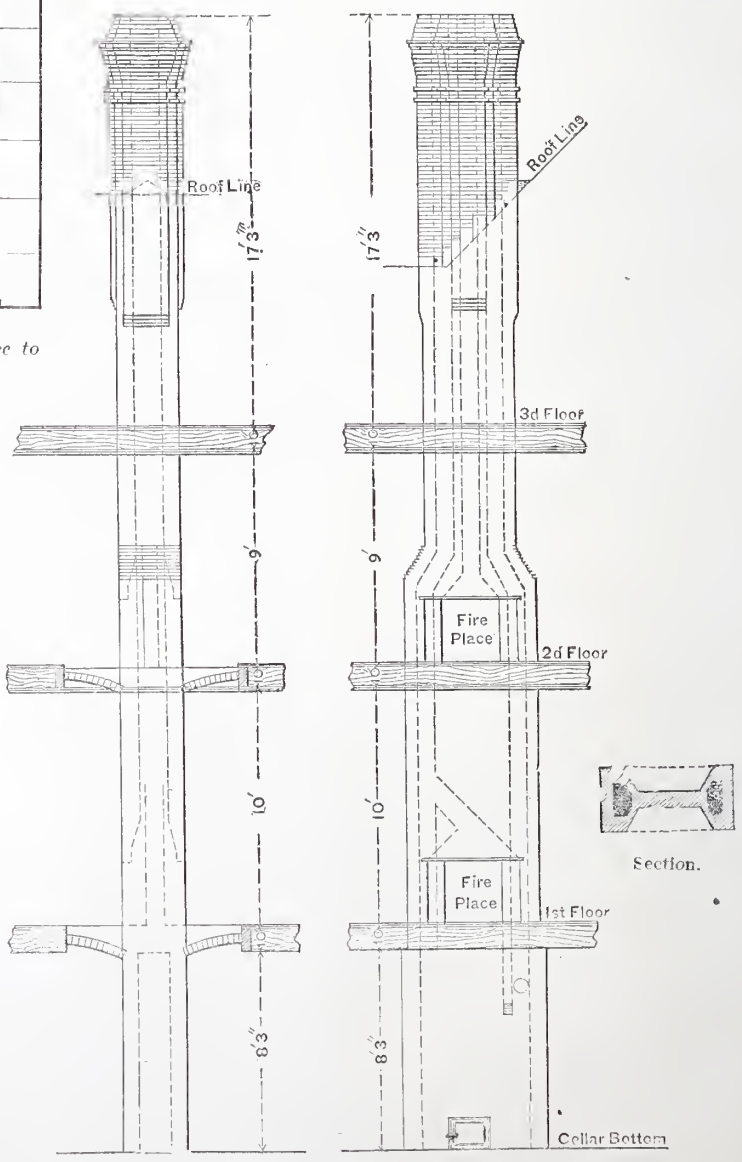
Who let the secret out, we wonder, with reference to the exact distance of the railroad (with its clattering trains) from our summer-house, and are we really obliged to do our heaviest reading there? During the progress of a lawn or croquet party, one of the principal uses of the summer-house would be developed, which our critic has neglected to speak of, and the smoking (with the permission of the ladies) would be carried on something like 8 feet above the heads of Bob, Mike and Tom as they passed down Station street, so they wouldn't mind it.

Yes, help are human, and frequently are as respectable as their employers, and in ratio as they are so, they are modest about intruding, and are quite satisfied to come in by the way provided for them, even if it be through a clean stable-yard. Mr. Archie himself would not object, when riding home without company, to alight in the stable-yard and walk up the same path which his respectable help are obliged to traverse, thereby saving both driver and horse an extra amount of labor. We are not exactly clear as to the proper method of preventing pedestrians from traveling over 25 or 30 feet of something, unless we put our house directly in the street line, and even then they might be obliged to cross the street. Has the use of concrete for walks and drives yet been discovered in Birmingham? No, the *porte-cochère* is not quite an unknown quantity with us, although we have so far been very well satisfied to call it plain carriage porch, and if gravel, dust and mud are inevitable in our carriage-way, we are at a loss to know how a carriage porch will prevent its being brought to the door.

*Study in Suburban Architecture.—Elevation of Entrance to Cellar.—Scale, ½ Inch to the Foot.*

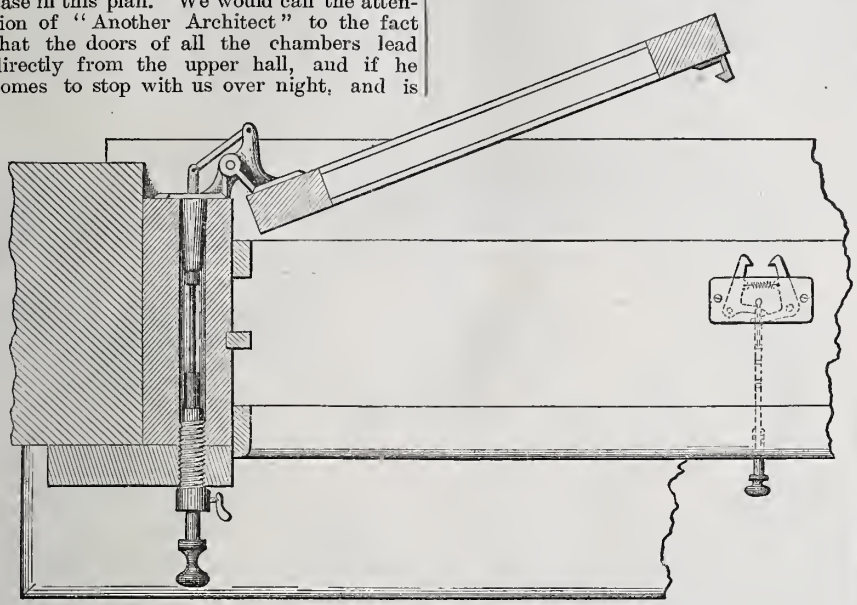
We beg leave to grumble at the statement with reference to the furnace and coal supply. Does our critic really think he could successfully heat the house with the furnace under the kitchen? And if the furnace was not there and the coal bin was, would not the same "cussing" referred to be indulged in by the person who was obliged to carry coal through the laundry and entry to the furnace? We should not like to have a coal cart driven over our lawn, but if by the way of the stable-yard, as is suggested, we could approach the northeast corner of the house, we should do so, and from that point have the coal carried to the cellar in baskets or to the window opening into bin. To dump a load of coal against an underpinning wall would never do. We believe that "Another Architect" overlooked the window over-seat, opening from the hall to the porch, and which commands a direct view of porch and entrance walk. The claim that the hall is not well lighted is one that cannot be well refuted on paper, but experience says that it is. The corner window in the library looks up Thoroughfare street. The corner window in the hall looks down Thoroughfare street; besides, it has been said that the best views were across the country to the south and east, toward the city; the north side of a house is not the most attractive outlook if the house is 60 feet back from the street.

The porch and steps on the south, although we do not consider them as such, are to provide a way for Mr. and Mrs. Archie to go on to the lawn, and are reached through a French casement from the sitting-room. It is not to be a "common mode of egress or ingress," and we don't intend to "cut across lots." We shall, however, invite our guests to go in and out that way to the croquet lawn. No, we shall not lug the balls and mallets in and out that way, but shall keep them in the summer-house or under the veranda. We shall try to keep our kitchen entry clean and a savory place by first keeping the stable-yard in the same condition. We have not forgotten that the upper hall was spoken of as an inner room,




*Front and Side of Hall Chimney.—Scale, ⅛ Inch to the Foot.*

and that it was to be used as a winter evening sitting-room, and it has light during the day (besides the window complained of) through the large opening from the study and by means of various top lights above doors opening into it. We don't think a linen closet should be opened from any room, except it be from the nursery, which is the case in this plan. We would call the attention of "Another Architect" to the fact that the doors of all the chambers lead directly from the upper hall, and if he comes to stop with us over night, and is shown the way in, and cannot find the way out that he has been obliged to traverse coming in, we shall be obliged to set him down as stupid. With all our diffidence, we have courage to say that we believe he is in the habit of being more deliberate in dealings with his clients than in this criticism.



*Novelties.—Fig. 1.—Horizontal Section Through Window, Showing the Operation of the Dudley Blind-Worker.*

## NOVELTIES.

### The Dudley Blind-Worker.

The inconvenience of raising a window-sash every time that a blind is to be opened and closed may be obviated by the employment of a novelty known as the Dudley blind and shutter worker, the general features of which will be understood by an examination of Figs. 1 and 2 of the engravings. The first, which represents a horizontal section through a window just above the sill, presents the general features of the device, while the second shows the appearance from the outside of the lower hinge employed From an examination of these two views it will be seen that the device is essentially a bell-crank on the outside of the shutter, operated by means of a rod and handle. A similar rod operates a spring catch, which fastens the shutter when closed. While the general operation of this device is very simple and easily understood, some considerable ingenuity has been displayed by the manufacturers—namely, the Dudley Blind and Shutter Worker Co., No. 14 Bible House, New York City—in the arrangement of details. Thus, referring to the parts that control the spring catch, in order to adapt them to any width of sill the rod is made long enough for the widest, and is partly cut in two by annular grooves at intervals in the length of the rod, each of which, while fitting the rod to the two catches to be operated, also facilitates cutting off at the proper length, an advantage that will be appreciated by carpenters, who would otherwise be obliged to do the work with tools ill-adapted to the purpose. These grooves are so near together as to make it possible to fit the rod very closely to any required length; what difference there is is easily arranged by allowing the knob to project a little more or less into the room. The operating parts in connection with the hinge are compensated in length by means of a right and left hand screw. The socket that surrounds this rod and forms the finish on the inside of the room screws into the casing, as clearly shown in the engraving. A joint in the rod allows the end to drop down against the face of the casing when the shutter is thrown clear back, thus avoiding the unseemly appearance of the handle projecting into the room. By means of a thumb-screw operating in the side of the socket through which this rod works, the shutter may be fastened in any desired position between closed and open. The joint in the rod, when the fixtures are properly set, by which the inner end drops down, fastens the shutter when thrown clear back. These fixtures are so constructed as to adapt them to use upon frames of all kinds, and do not in any way interfere with windows hung with weights. A modified form of the worker is furnished to go upon shutters hung with ordinary hinges, the essential features of which are the same as here described.

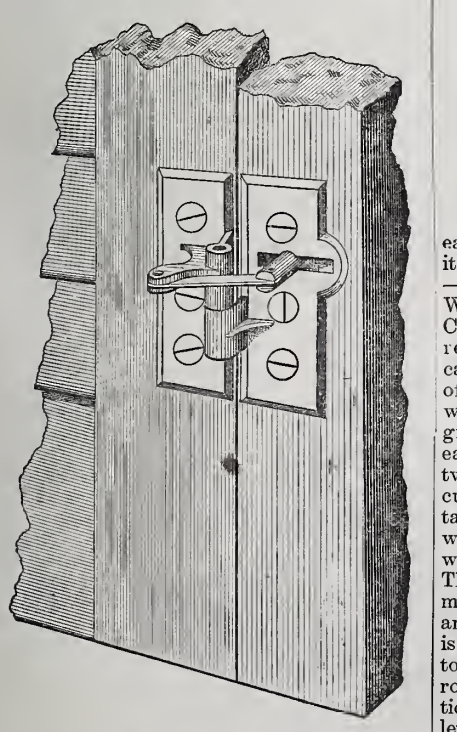


*Fig. 2.—Exterior View of Blind, Showing Lower Hinge with the Blind-Worker.*

### Wire Wardrobe Hook.

Messrs. Van Wagoner & Williams, of 82 Beekman street, New York, are offering a line of wire coat, hat and wardrobe hooks (one of which is illustrated in Fig. 3 of our engravings) that possess features that render them of interest to builders generally. The hooks are made in various styles, adapting them to all the purposes to which similar articles of hardware are applied, embracing hooks of different sizes of the general shape shown in our engraving, combined hat and coat hooks, ceiling hooks, &c. In most of the styles shown in their circular the hook is fastened in place by a screw-thread cut upon the wire, as shown in the engraving. In some, however, a malleable casting is used for the part fitting next the wall, into which the wire is firmly bedded, the whole being fastened in place by screws. These hooks have the advantage of being very neat in appearance, are strong and durable, and are so easily put in place as to at once recommend them to favorable notice.

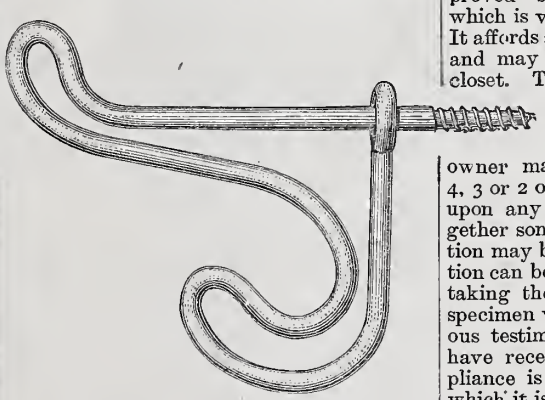


*Fig. 3.—Wire Wardrobe Hook.*

### Stem-Winding Permutation Lock.

The D. K. Miller Lock Co., of Philadelphia, Pa., have sent us a specimen of their improved stem-winding permutation lock, which is very serviceable for many purposes, It affords security in a very simple manner. and may be adapted to any drawer, till or closet. The lock, which is shown in the accompanying engraving, is said to represent an entirely new departure in lock mechanism. The owner may use any combination of any 4, 3 or 2 of its dial numbers, or may work it upon any one number at pleasure. Altogether some 10,000,000 changes of combination may be made. Any proposed combination can be set in a very short time without taking the lock apart. Judging from the specimen we have examiued and the numerous testimonials which the manufacturers have received, it would seem that the appliance is well adapted to the purpose for which it is intended. The finish and design are ornamental and attractive; every lock is handsomely nickel-plated unless finished otherwise to order. The lock is about 2 x 2¼ inches in size, and its price is so low as to bring it within the means of every one. It operates equally well in all positions, and being smaller than other dial locks, considerable space may be saved by its use.

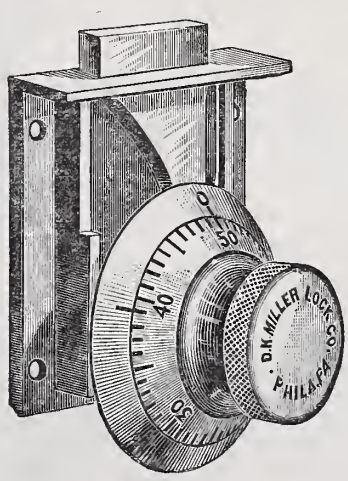



*Fig. 4.—Stem-Winding Permutation Lock.*

### An Automatic Drill.

Messrs. Pope & Stevens, 114 Chambers street, New York, are offering what is known as the Chicopee automatic drill, which comprises some features that render it of special interest to our readers. The drill is adapted for use in metal or wood. Fig. 5 of the engravings shows the tool, while Figs. 6 and 7 show details of the operating mechanism by which the motion is obtained. As will be seen by reference to the latter cuts, the slide has right and left handed nuts to match the right and left hand grooves in the spindle. One of these operates on the forward and the other on the backward stroke, so that moving the slide up and down gives the drill a continual motion in one direction only. The chuck employed in this drill also deserves mention. It is made of steel, with hardened-steel jaws, and is held on the spindle by friction, and can be easily removed to use on lathes or other tools. It is accurately made to hold Morse twist drills to 3-10ths inch in size, and in all respects is well adapted to the purpose to which it is applied. The end of the handle of this tool is made hollow, with a cap to screw, thus providing a convenient receptacle for the tools used with it.

*Novelties.—Fig. 5.—The Chicopee Automatic Drill.*

### Brick Machines.

The Peerless Brick Co., of Philadelphia, Pa., are now offering the Peerless brick machine, a device that has been used by this company for five years past in the manufacture of brick, and which has made their name familiar from one end of the country to the other. The special advantage that they claim for this machinery is that it thoroughly tempers the clay, thus giving to its product a solidity and symmetry that makes it preferable to the hand-made article. The statement is made that experience has shown that brick made by the Peerless machine undergoes the process of burning without cracking. A neat circular has been issued by the company, with a cut of the machine and a statement of the advantages claimed for it, together with a brief description of the merits of the three general classes of machines that are used in brick-making.

### Keystone Flooring Machine.

The increasing demand for special machinery for special purposes is becoming more and more imperative, and the makers of wood-working machinery are constantly confronted with problems of this kind. Particularly has this demand been urged for a strong, compact, simple and fast-feeding flooring machine. In the accompanying illustration we present to our readers a general view of the Keystone flooring machine, designed and manufactured by Messrs. Goodell & Waters, of Philadelphia, Pa. Retaining the most desirable features of the Woodworth machines, it contains many noticeable additional features, among which are the adjustments of the pressure bars to and from the cutters, so as to enable the operator to extend them when a deep cut is desired, and to set the bars close to the knives at all times. Another feature of importance is embraced in the guides for the lower head, which are yielding, to prevent undue friction on the lumber. The matcher head has a divided expansion cut which enables it to work easier without slivering the wood or pulling out knots, and a tongue and groove can be adjusted for wet and dry lumber. This also admits of easing the tongue without removing the cutters when they are worn. This is probably the most economical feature of the machine, as it effects a great saving in cutters, since one set of cutters will work any tongue and groove from ⅜ to ¾ inch. The machine is particularly well adapted for fine work, such as moldings, wainscoting and ceiling. Attention should also be called to the raising and expansion gears, and to the sides, the housings for rolls being cast on. The countershafting has tight and loose pulleys 12 inches in diameter, and 8 inches in face, with a speed of 850 revolutions per minute. In all respects the machine has been carefully designed, and the best construction has been embodied in it.

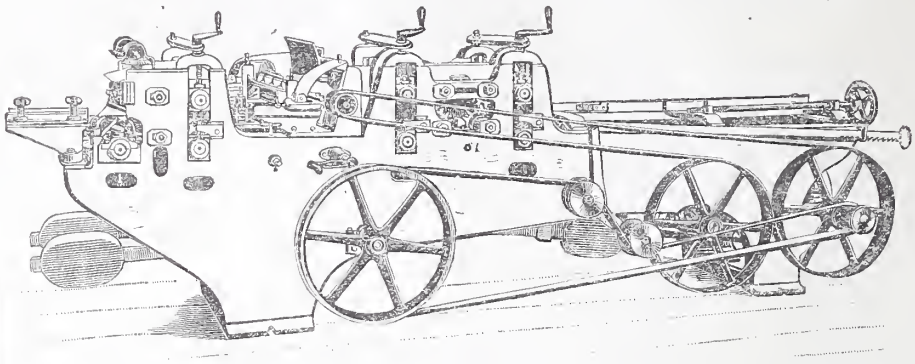


*Fig. 8.—The Keystone Planer, Built by Goodell & Waters, Philadelphia.*

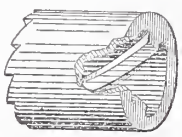
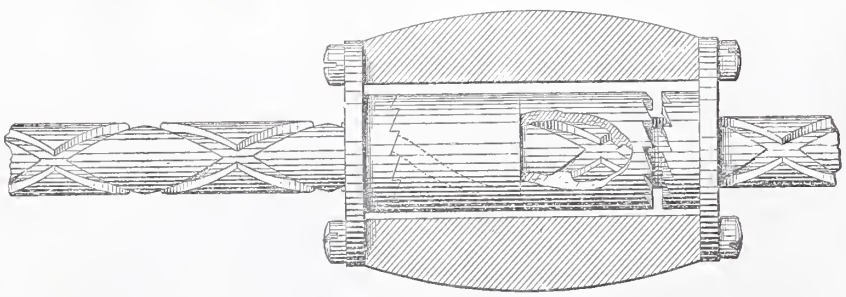


*Fig. 7.—One of the Nuts Broken, Showing Projection which Works in the Grooves in the Spindle.*



*The Chicopee Automatic Drill.—Fig. 6.—Enlarged View of Spindle, Showing Construction of Slide.*

The most important statement contained in the circular is that the company have two machines in constant operation at their works in Philadelphia, and that they are willing to make into bricks, dry in their ovens and burn in their kilns, if desired, any sample of clay that may be sent to them from any part of the country, freight prepaid. Inasmuch as the utility of many brick machines depends somewhat upon the nature of the clay to be worked, it would seem that this free test would enable any one to determine beforehand the exact merits of the Peerless brick machines for use under given circumstances.

## TRADE PUBLICATIONS.

### Metal Catalogue.

Messrs. Merchant & Co., dealers in metals, with offices at No. 525 Arch street, Philadelphia, and No. 90 Beekman street, New York, have issued a very neat catalogue of their specialties, bound in a bronze cover which closely imitates a sheet of tin plate. The letters are in black, and altogether the pamphlet is quite attractive in form. It contains many items of information valuable to builders who make their own estimates and who desire to superintend their work in general. Among other things of this character may be mentioned full particulars with reference to copper, the size of sheet, weight per square foot, and the dimensions of stock sizes. Brass, copper and zinc tubing are given, with the weight per foot of various diameters; the weight of galvanized sheet iron per square foot for different gauges, together with the list price per pound; also the weights of black sheet iron and various particulars with refereuce to corrugated iron are given in appropriate tables. Tin plates are very carefully described and points are named that will enable the contractor to judge of the quality of plates by simple inspection. A table of gauges and weights of plates is presented in such a form as will enable the builder to determine whether or not he is receiving work from the tinners with whom he contracts according to specification. There are numerous other features which might be mentioned, and which should make this book in demand. We understand it is sent to all applicants.

### Houses for Artisans in Paris.

High rents have long been the grievance of Parisian, as of New York and London, artisans, and the Préfect of the Seine, recognizing the justice of the complaint, has turned his attention to the matter with a view of finding a remedy for the evil. A committee has been appointed to study the question and pronounce upon the respective merits of the different solutions proposed for it. A project drawn up by M. Lalanne appears likely to be taken into serious consideration. He suggests that the city of Paris should borrow a sum of $3,200,000 from the Crédit Foncier, at 4 per cent. interest. This sum would be laid out in the purchase of eight plots of ground situated within the fortifications, but outside the exterior boulevards, and in the building of eight large houses, or *cités*, for workingmen, each plot of ground and each house to cost $200,000 respectively. The rent of lodgings in these blocks or buildings would be fixed at $24 per year at the minimum and $70 at the maximum. In order to facilitate communication with the place of employment a line of tramways would be opened, by means of which, for 2 cents, artisans could be conveyed to the center of Paris in the morning and taken home in the eveniug. The workingmen's building would, as a matter of course, be provided with all the appliances conducive to health and cleanliness, and instead of their living, as at present, huddled up with their families in a wretched attic, lacking both light and air, they would be relatively roomily lodged at a lower rent than they pay in the city streets.

## Number of Stories for Mills.

Whether there can be any real permanent advantage derived from the use of huildings of more than one story for manufacturing purposes has hecome an important question in several particulars. It is a noteworthy fact that the competition among insurance companies—or, what is the same thing, the desire of a mutual company to work at lowest rates—has led of itself to marked changes in respect to buildings, and some other things hesides, which some of the clearer headed and progressive men in the mills have advised and urged for years, and the one-story building is one of these. It may he quite true that to lift the raw material from one story to another will require so small a fraction of the whole power which must be paid for every day in the working of the mill as to be not worth counting, but the cost of elevators is considerable when enough of them are provided to meet fully the wants of the establishment. Some things, like wheat, will go down hy their own gravity after they have been once raised to the full hight needed; but in general material must be loaded and unloaded to get it down, as well as up. Of course, the choice lies between having one story, or workroom, over another, and placing it at one side, either immediately adjoining the first or at some distance from it.

The points involved in this choice are chiefly the additional foundation needed if a separate building he put up, the additional area of roof that must then be covered, the greater weight and strength of floor called for in a second story, the convenience of connection to the principal engine or water-wheel, the trouble or delay likely to ensue from going out of doors from one building to another, especially in cold weather, and also the greater convenience in general of heating and managing the work done in a single compact building than in two or three separate ones of an equal floor area. It is prohable that those who stake their money upon the security of such buildings against fire will eventually become, if indeed they are not now, the arhitrators between those who may hold opposite views on these important points. Certainly none can he more fully qualified than those ought to he who make a business of this, risking their money upon the correctness of the views they hold. Such men are far more apt to see the weak points, or the bad ones, in a piece of work of this general character than those are who have looked so long and intently at their own designs while executing them that they forget the possibility that there may be something different in the world, or even better. It may be a little doubtful whether all mill owners would readily consent to do things, in the current operation of their mills, that would involve more cost, at the suggestion or direction of an insurance company or board, but it is certain that no reasonahle or prohable requirement from any such source can be safely neglected or ignored in respect of such a thing as a building or an arrangement of premises. It is rarely the case that suggestions of this general character do not grow out of the study of well-considered and successful experience, although in this particular there are men to be found in the world who are very distrustful of any one's experience except their own. Such men, in perfect honesty, no douht, yet with no less disadvantage to themselves, look upon insurance inspectors as non-practical book men, even though at the same moment these visionaries may have at their command and upon their tongues, ready for instant use, a whole volume of suggestions for the greater safety and economy of the working of the mill, or for its judicious and prudent enlargement. The subject of the proper design of mills for manufacturing purposes is a very wide one, and is worthy of careful study in the particulars specially mentioned, as well as in many others.

## Competitive Design in Elevations and Details in the Sixth Competition.

In our issues for the last half of the volume for last year we presented several of the designs suhmitted in the Sixth Competition, the leading features of which were that they were all to the same plan, thus affording an opportunity for comparison of the efforts of different designers when confined to the same subject. We herewith present a perspective view, elevations and details of still another effort of this same kind, which will close our selections from the plans submitted in the Sixth Competition. The author of the plans herewith presented is Mr. C. E. Willoughhy, of Perth Amboy, N. J. From the general particulars submitted by the architect with his plans, we gather the following points: The attic plan, which was left to the discretion of the competitors, has been made commodious and roomy, large closets in the chambers on the second floor heing rearranged so as to effect this object. For this purpose they were placed alongside of the chimney shafts. The stair landing is commodious and is placed in the center of the building, affording ready communication to the several chambers. The room under the tower has been made of sufficient size to be used as a dressing-room or hoys' bedroom. The author of these plans points out that the roof has been made a special study, and has been so arranged as to carry off the water without obstruction at any point. A flat has been made over the portion of landing be-

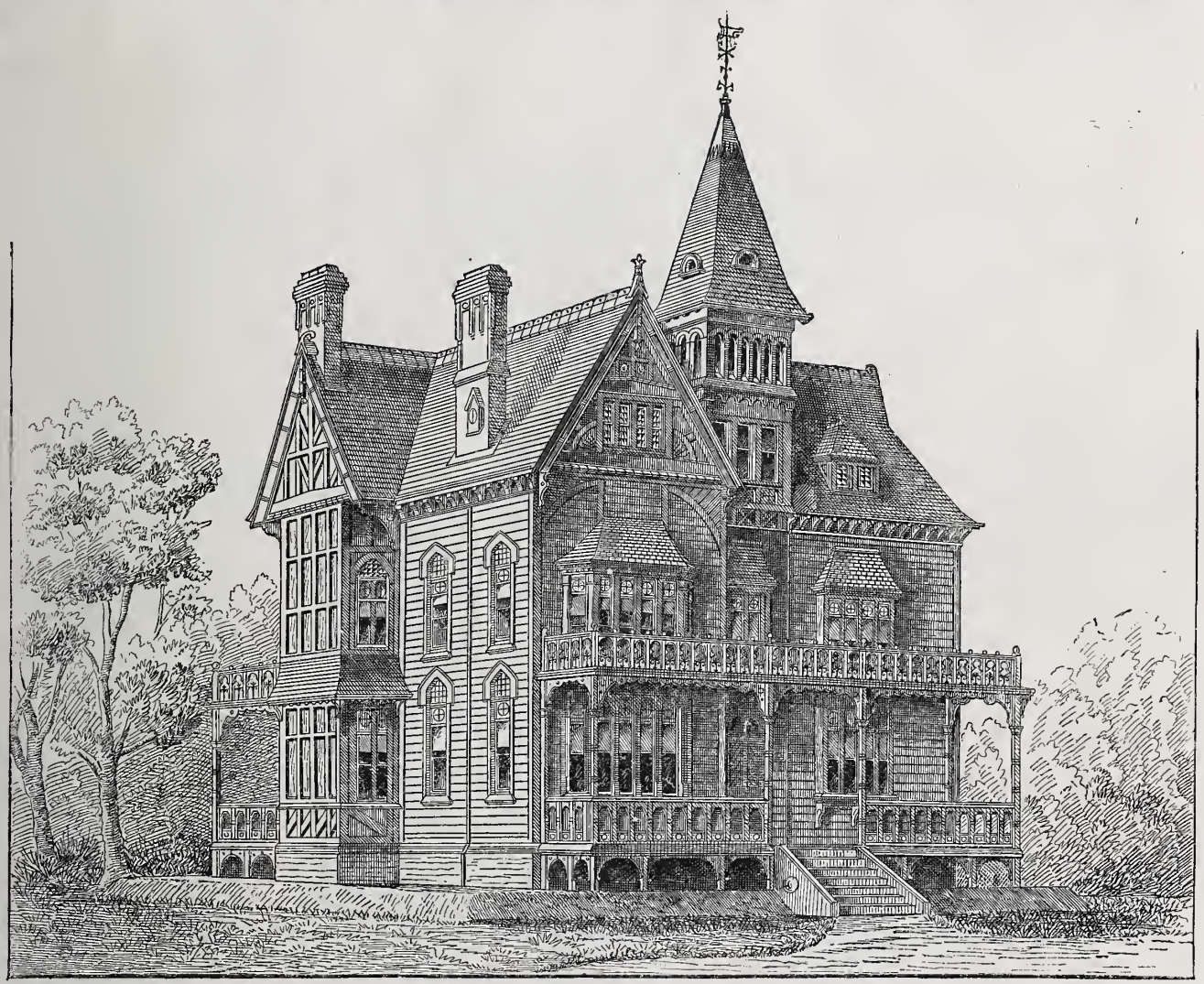
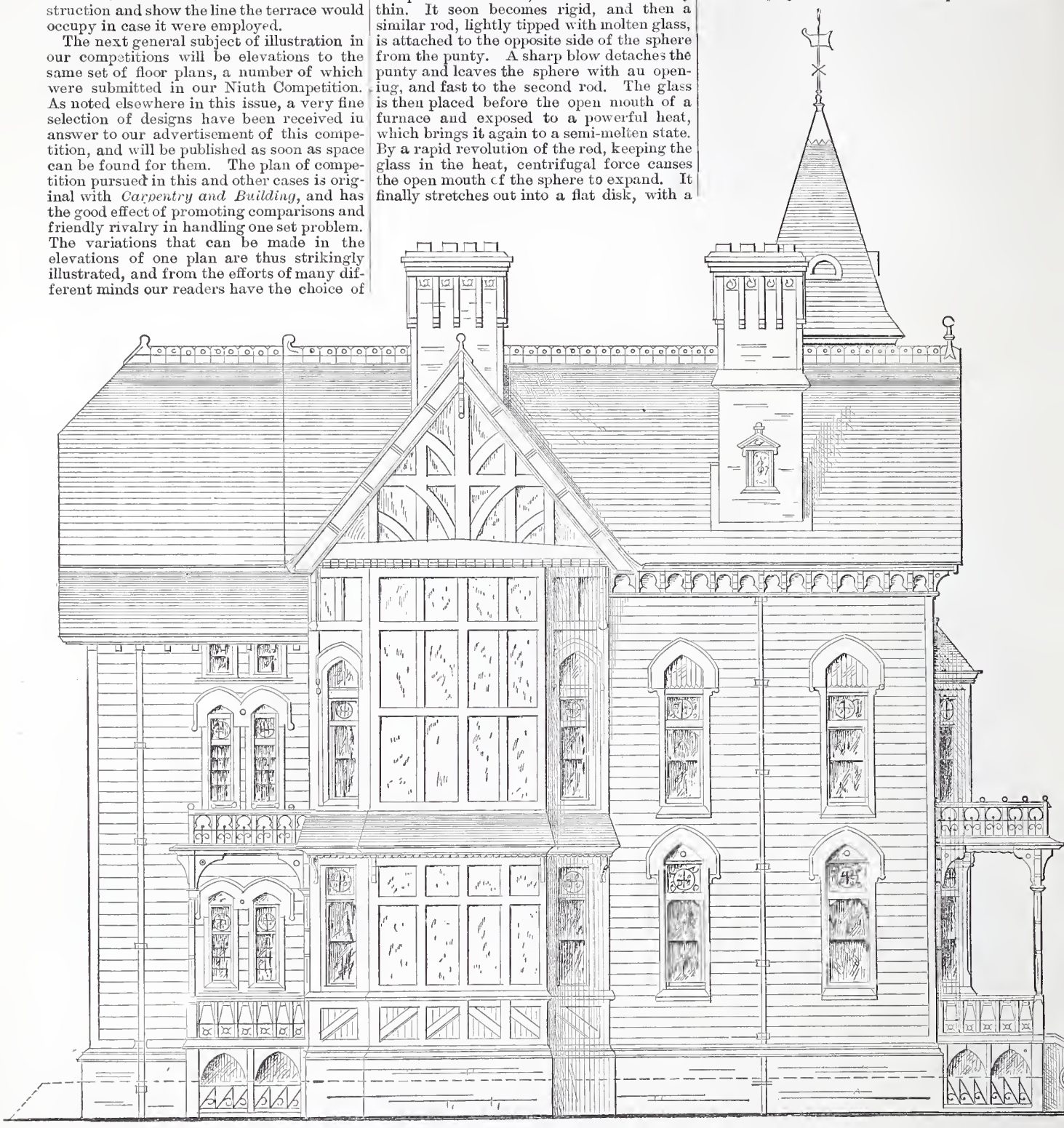


*Fig. 1.—Perspective View.—Mr. C. E. Willoughby, Perth Amboy, N. J.*

COMPETITIVE DESIGNS IN ELEVATIONS AND DETAILS IN THE SIXTH COMPETITION.

tween roofs, as shown in the roof plan. In the arrangement of the grounds about this building the author has had two general plans in view, one employing a terrace and the other without. The perspective view, as it has been prepared, shows the terrace, while the elevations indicate alternative construction and show the line the terrace would occupy in case it were employed.

The next general subject of illustration in our competitions will be elevations to the same set of floor plans, a number of which were submitted in our Ninth Competition. As noted elsewhere in this issue, a very fine selection of designs have been received in answer to our advertisement of this competition, and will be published as soon as space can be found for them. The plan of competition pursued in this and other cases is original with *Carpentry and Building*, and has the good effect of promoting comparisons and friendly rivalry in handling one set problem. The variations that can be made in the elevations of one plan are thus strikingly illustrated, and from the efforts of many different minds our readers have the choice of many suggestions that cannot fail to be of advantage and value to them.



*Competitive Design.—Fig. 2.—Side Elevation.—Scale, ⅛ Inch to the Foot.*

## Window Glass.

Window glass, as popularly known, is, in contradistinction to plate or cast glass, a blown or sheet glass, and, as in all others, a compound of sand and alkali melted in large clay crucibles until it assumes a liquid form. The date of its discovery is obscure, but belongs somewhere in the early centuries of the Christian era. Its first practical form was crown glass; this manufacture may in a manner be explained by referring to a popular amusement among children—the blowing of soap bubbles. The child gathering the soapy water on its pipe, and carefully blowing to form the bubble, is but a representation of the man gathering the molten glass on his pipe. The latter is a hollow iron rod, 2 inches in diameter and 5 or 6 feet long, and is called a "punty." The glass worker blows until a glass bubble or sphere is formed, which is necessarily thin. It soon becomes rigid, and then a similar rod, lightly tipped with molten glass, is attached to the opposite side of the sphere from the punty. A sharp blow detaches the punty and leaves the sphere with an opening, and fast to the second rod. The glass is then placed before the open mouth of a furnace and exposed to a powerful heat, which brings it again to a semi-molten state. By a rapid revolution of the rod, keeping the glass in the heat, centrifugal force causes the open mouth of the sphere to expand. It finally stretches out into a flat disk, with a loud "flap." A slight blow detaches the second rod from the center, and there remains a large circular disk with a lump, called a "bull's-eye," in the center. The disk then passes through an annealing furnace, and is cut into regular sizes for the market. The bull's-eye is a waste product, and in consequence, no very large sizes can be made. In a circle 60 inches in diameter, with 6 inches at the center cut out, there will be a material waste and consequent enhancing in value of the parts that can be used. Crown glass, however, is remarkably lustrous, and clear from many imperfections seen in cylinder glass, about which we shall speak later. In many old houses there may be seen bull's-eyes dotted over the windows. These were used in the time these houses were built as a matter of economy, as well as necessity; when cylinder glass supplanted the crown, these bull's-eyes remained, but no more were added, until within five years, when a sudden rage for reminiscences of antiquity led aspirants for novelty to pay as much as $1.50 each for this waste product of 100 years ago. Where these are used, care should be taken that, acting as burning glasses, they do not concentrate the rays of the sun on some inflammable object, and so set fire to the building. Instances of this character are on record.

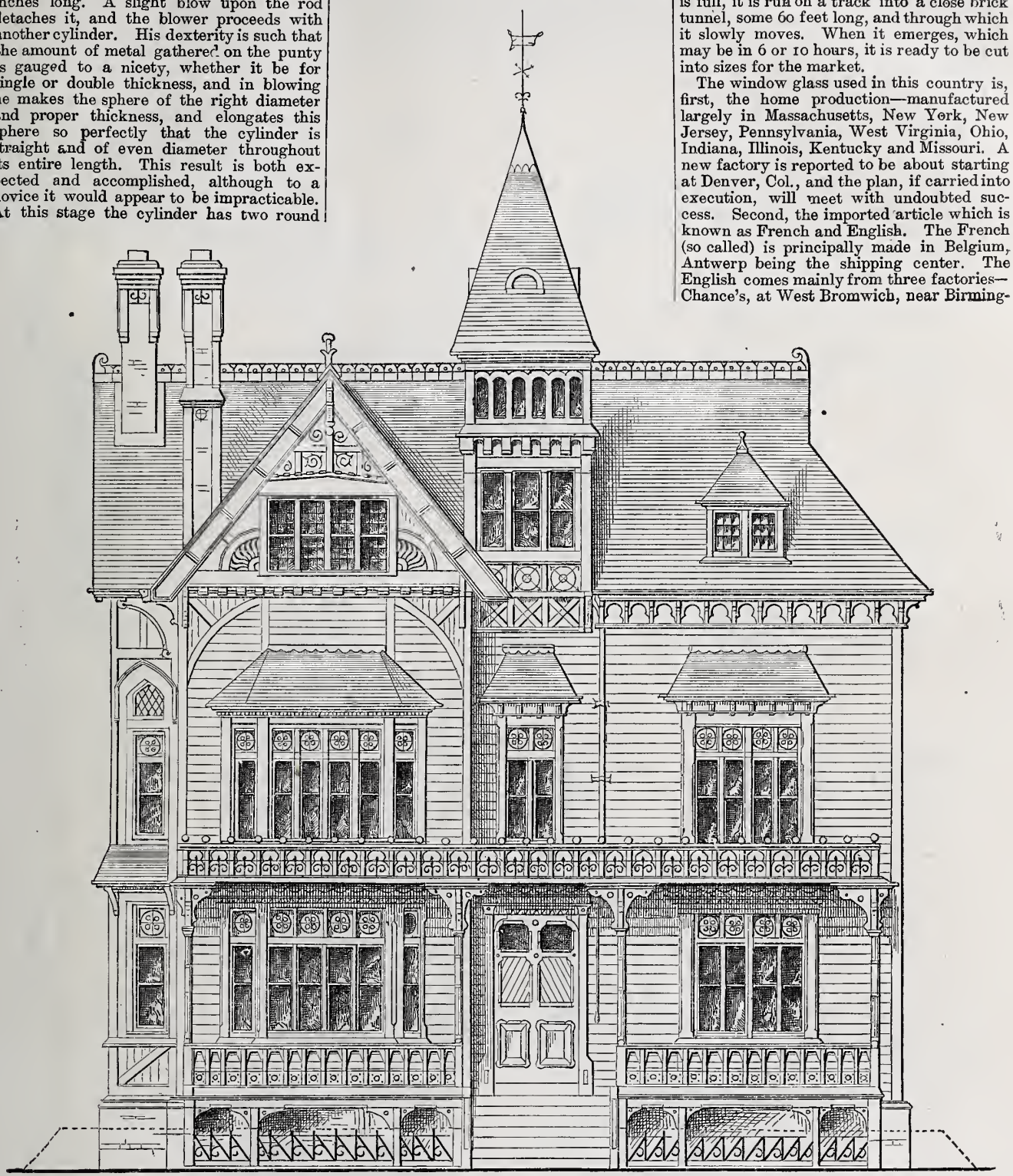
Cylinder glass, the window glass of commerce, is made generally over the civilized world, especially in Belgium, England and the United States. The soap-bubble principle applies to it as well as to crown glass. When the workman or blower gathers sufficient metal on his punty he blows the sphere, holding the metal downward. By this means the principal part of the metal flows to the bottom of the sphere; the blower then swings his pipe with a pendulum-like movement and blows at the same time. The sphere

elongates until the glass becomes in a measure rigid, which is detected by the pressure of the breath. The glass is then put in the mouth of the furnace and softened, when the same process is repeated until the sphere becomes a cylinder, sometimes 80 or 90 inches long. A slight blow upon the rod detaches it, and the blower proceeds with another cylinder. His dexterity is such that the amount of metal gathered on the punty is gauged to a nicety, whether it be for single or double thickness, and in blowing he makes the sphere of the right diameter and proper thickness, and elongates this sphere so perfectly that the cylinder is straight and of even diameter throughout its entire length. This result is both expected and accomplished, although to a novice it would appear to be impracticable. At this stage the cylinder has two round ends. When it has become cold a thread of molten glass is wrapped around and touched with a drop of cold water, which causes the ends to drop off; it is then split longitudinally by means of a hot iron rod rubbed in a straight line along the inside, and a touch of water, or by a diamond cut, when it is ready for flattening into a sheet. This is done by placing it—the split or fractured side being upward—on a large stone or brick 40 x 80 inches in size and 10 inches thick, the surface of which is specially prepared and very smooth. These stones are placed in a reverberatory furnace heated to from 1800° to 2500° F. In 3 to 5 minutes the glass shows signs of softening; a workman, called a "flattener," proceeds to open the cylinder at the split with long iron rods. In some 10 to 15 minutes after being placed on the stone it is spread out flat and smooth, a sheet of window glass.

The next operation is annealing; this is done by two methods. The slowest, as well as the most effective, way is by transferring the stone and glass to a cooler, or annealing oven, and then with large iron forks lifting the glass, which, owing to the lower temperature, has become rigid, and piling it on edge in the rear of the annealing oven. This oven is kept at as high a temperature as possible without being so hot as to cause the glass to bend. When the oven is full, it is allowed to cool off gradually, and the glass is removed for another charge. The other mode, that is almost universally used, is as follows: The glass is flattened on a set of stones that revolve on a circular track in a rotary furnace. As soon as one is done it is turned into a slightly cooler chamber. This brings another stone in play for flattening, and the process is repeated until the original stone has passed through sufficient cooling chambers to make the glass rigid. It is then, by means of forks, laid on an iron frame capable of holding 30 or more sheets, divided into layers of five or more each. The stone is now free for flattening another sheet. When the iron frame is full, it is run on a track into a close brick tunnel, some 60 feet long, and through which it slowly moves. When it emerges, which may be in 6 or 10 hours, it is ready to be cut into sizes for the market.

The window glass used in this country is, first, the home production—manufactured largely in Massachusetts, New York, New Jersey, Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Kentucky and Missouri. A new factory is reported to be about starting at Denver, Col., and the plan, if carried into execution, will meet with undoubted success. Second, the imported article which is known as French and English. The French (so called) is principally made in Belgium, Antwerp being the shipping center. The English comes mainly from three factories—Chance's, at West Bromwich, near Birmingham, which is probably the largest factory in the world; Pilkington's, at St. Helen's, near Liverpool; and Hartley's, at Sunderland. The former is about the only factory that can successfully make the glass for lenses for large telescopes.

Window glass is principally sold in three thicknesses—single, which is supposed to weigh 16 ounces per foot square; double, or 21 ounces per foot, and 26-ounce glass, which should weigh 26 ounces per foot. It is doubtful whether these weights are sustained in all cases. Window glass is also sold in four grades—firsts, seconds, thirds and fourths, the firsts being that which is the clearest and most free from bubbles, scratches and wave lines, and gives the least distortion when looked through; even thickness



*Competitive Design.—Fig. 3.—Front Elevation.—Scale, ⅛ Inch to the Foot.*

also enters into consideration. The grades run down to the fourth as these imperfections appear. The second and third qualities may be considered the average, the production and sale in these being the greatest. The first is a selected quality, and above the average, while the fourth is a low grade, sold really as a refuse, and used where quality does not matter.

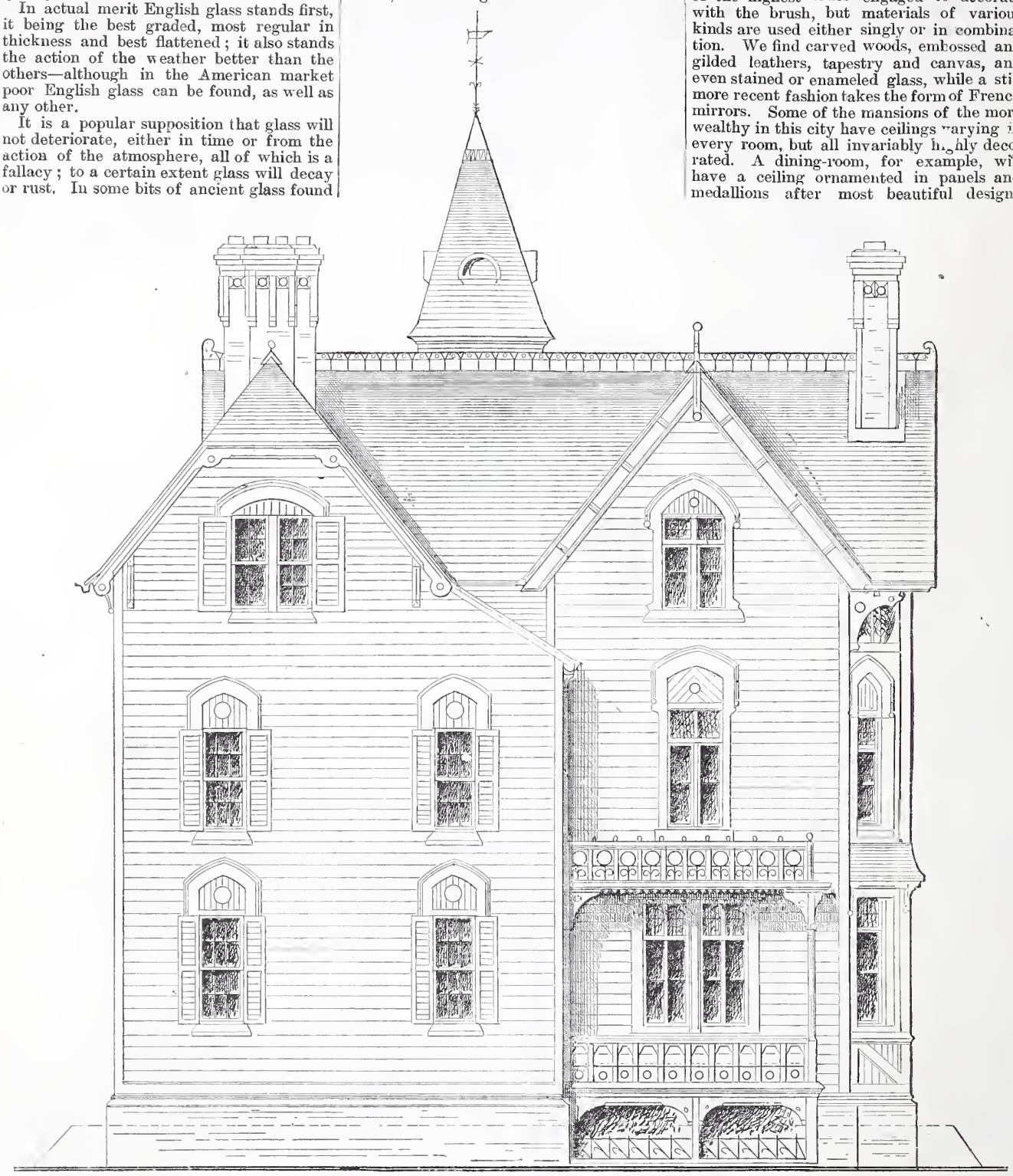
In actual merit English glass stands first, it being the best graded, most regular in thickness and best flattened; it also stands the action of the weather better than the others—although in the American market poor English glass can be found, as well as any other.

It is a popular supposition that glass will not deteriorate, either in time or from the action of the atmosphere, all of which is a fallacy; to a certain extent glass will decay or rust. In some bits of ancient glass found in Egypt and Pompeii an iridescence seemed to pervade the whole, which at first was presumed to be a characteristic of the manufacture, and one of the lost arts. Later proof demonstrates this to be an error, and ascribes the iridescent quality to decay. We frequently see all the hues of the rainbow reflected from a pane of window glass. This is caused by the disintegration of the glass—a simple rust, as palpable and positive as the rust on a stove-pipe. During the past 20 years the manufacturers have sought by proper chemical composition to remedy this evil, and have in a great measure succeeded. The American article in times past was notoriously subject to rust, principally owing to the desire of the manufacturer to save as much time and expense as possible, and so introducing a surplus of alkali. There is no reason why American window glass should not be produced as perfect in every way as any in the world. The materials are at hand and are equal to any, and in brains the American should not rank below any; but it certainly is a fact that in quality, as a whole, American grades are lower than the foreign. It does not weigh as much per 100 feet, and unless there has been very great improvement recently it will stain or rust much more quickly than the foreign; it is not as strong and will not command as high a price. There is reason in all this, and in the matter of the pocket-book alone it behooves Americans to see that their production is equal, if not superior, to all others. Some manufacturers claim this superiority now. If they are correct, why is the foreign article preferred? Trade is not blind, and will not support a principle for the name only.

A new custom house is to be erected at El Paso, Texas, to cost $125,000.

## The Treatment of Ceilings.

The attention bestowed upon ceilings by architects and decorators is producing some noteworthy results. To appreciate what can be done in this one item of interior decoration, it is only necessary to visit the leading decorators in this city. Not only are artists of the highest order engaged to decorate with the brush, but materials of various kinds are used either singly or in combination. We find carved woods, embossed and gilded leathers, tapestry and canvas, and even stained or enameled glass, while a still more recent fashion takes the form of French mirrors. Some of the mansions of the more wealthy in this city have ceilings varying in every room, but all invariably highly decorated. A dining-room, for example, will have a ceiling ornamented in panels and medallions after most beautiful designs painted in oils. One which we have in mind has upon the panels copies exquisitely made from Raphael's Vatican cartoons, while the medallions bear wreaths of delicate and fragile flowers, from which peep laughing cherubs. In the library darker effects are sought by the use of woods. The more modern style is to rely for effect not so much upon elaborate carving as upon the light and shade produced by the tones of the wood when polished and paneled. Mahogany is especially effective, and is as much in favor for this purpose as for every form of decoration at the present time. In music-rooms the introduction of red is considered very desirable, and cherry is much used, while occasionally, when expense is an object, Cali-



*Competitive Design—Fig. 4.—Rear Elevation.—Scale, ⅛ Inch to the Foot.*

fornia redwood plays an important part. One of the most beautiful ceilings we have recently noticed was a Japanese design in carved wood. Brought out in fantastic relief against dark-red Souchow was a pagoda shaded by drooping foliage of almost impossible trees, beneath the spreading branches of which sat a group of Orientals in apparent contemplation. Red lacquer often produces the same effect as the Souchow, and, being much less expensive, is frequently one of them is deputed to examine the room and report as to the most suitable form to be selected. Of the various styles now in favor the most popular are those known respectively as the Chinese, Japanese, Moorish and Renaissance. Where the fittings and furniture of a room are of an Oriental character, it is now considered proper to decorate the ceiling in Moorish designs. Papier-maché is a material recently introduced, which is exceedingly effective in combination centers in framework of plaster heavily overlaid in gold, with every beautiful device that fancy can picture. An exquisite border for a ceiling of this description consists of a row of mammoth palm-leaves. A ceiling conspicuous for artistic excellence is in hand for a newly decorated house in this city. The design intended for the drawing-room is exceedingly beautiful. The center is a historical picture in oil by one of the Academy artists. Four panels continue the theme,

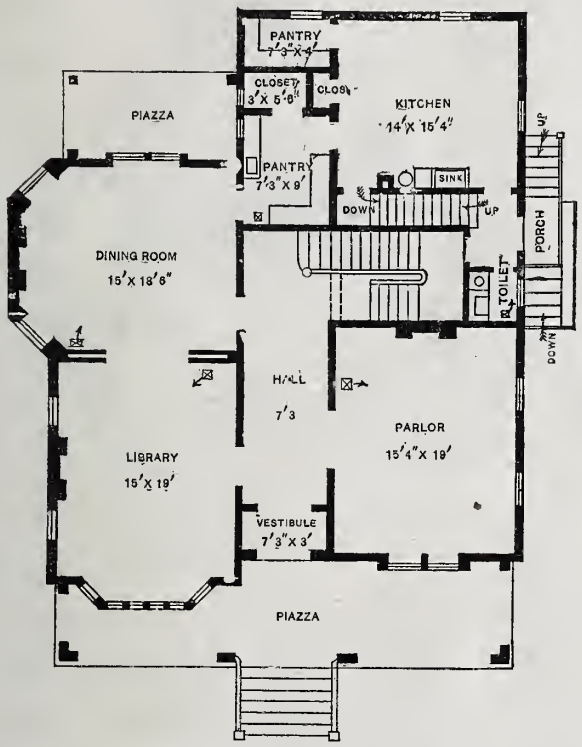



*Fig. 5.—First Floor Plan.—Scale, 1-16th Inch to the Foot.*

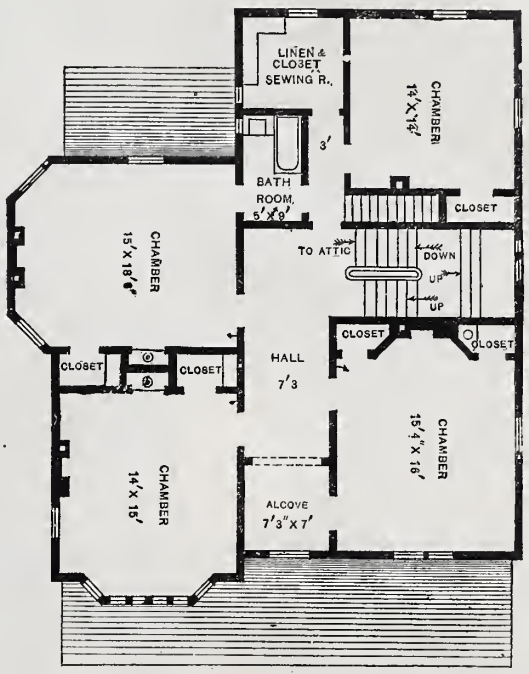



*Fig. 6.—Second-Floor Plan.—Scale, 1-16th Inch to the Foot.*

*Fig. 7.—Attic Plan.—Scale, 1-16th Inch to the Foot.*

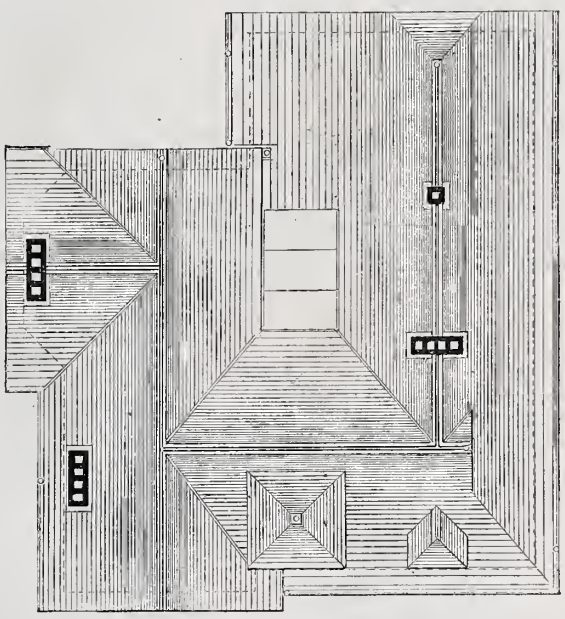


*Fig. 8.—Roof Plan, Scale 1-16th Inch to the Foot.*

## COMPETITIVE DESIGN IN ELEVATIONS AND DETAILS IN THE SIXTH COMPETITION.

used. Many considerations enter into the question of the embellishment of ceilings. An artistic decorator first makes himself master of all the architectural details of a room. If it is already furnished expensively, or has fittings of a permanent character, the choice of appropriate ornament for the ceiling is, of course, greatly limited, and still more so where stained glass plays any part in the windows. Large establishments in this city have quite a staff of artists, mainly Italians, French or Germans, and when the question of interior decorations comes up with gilding or raised gold-work, and plays an important part as setting of framework for panels, medallions, &c. In many instances, where expense is no object whatever, semi-jewels figure conspicuously in the illumination of the ceiling. All the brilliant and gleaming effect of a mine of various gems is thus introduced in the inverted order, and the dazzled spectator beholds overhead a rich profusion of coloring difficult to paint in words. At other times French mirrors of rhomboidal form are used in the place of the jewels, and form innumerable flashing and the intermediate spaces are occupied by rare medallions, all of which interpret, by a kind of by-play, the grand and dominant idea of the center. It is scarcely possible to do justice to the exquisite delicacy of the details displayed in the border, which is the setting of this beautiful work of art. Composed of raised and ornamental plaster, every line becomes a line of beauty, owing to the airy lightness of the design or to the vivid coloring.

Great interest attaches to the methods by which these ceilings are produced, and the

workshop attached to a large decorative establishment will repay a visit. There the artist creates and the artisan carries out in various materials the designs submitted to him. The most beautiful effects are arrived at even in plaster, and designs of fruit and flowers, foliage, or even figures destined for panels, are to be seen on every hand. While the plain white plaster ceiling is scarcely to be considered fashionable, modifications of it in which deep borderings are introduced are very usual. Intricate designs are molded in this material and serve their part either as panels or medallions. Perhaps one of the most curious materials used in ceiling decoration is that known as mosaic glass. It will be readily understood that it is fitted only for houses where luxurious appointments predominate, and its use is mainly restricted to the ceilings of large dining-rooms or banqueting halls. The method of preparation differs somewhat from that of ordinary stained glass. A coating of gold or silver leaf is supplied as a background, the result being that, instead of the beauty of effect depending upon passing rays of light, the most brilliant results follow from side lights. The effect is enhanced where jewels and crystals are introduced. Leather, as we have seen, also plays its part in ceiling decoration. The gilded and illuminated leathers in imitation of the antique are much used, generally in combination with cross-bars of wood, while embossed and painted leathers are also much liked, for the reason that they catch every varying ray of light and give a different appearance to the room at different hours of the day. The cost of ceiling decoration varies, of course, considerably. A plain fresco, which is sufficiently effective, may be painted for $150, while some of the more elaborate ceilings in the city cost over $1000, and the expense is practically limitless. If we commence a consideration of the artistic value of such ornamentation, we find ourselves entering upon a wide field, so much necessarily depends upon the surroundings. There are plenty of cases where a plain white ceiling, picked out with a bordering of deep color, is more effective than the most elaborate painting or combination would be. In the majority of cases—in all houses, in fact, of ordinary size and value—the less brilliant the coloring of the ceiling the better, whereas in mansions, public buildings and banqueting halls great latitude may be allowed. If space permitted there are many ceilings of which a description would be of the greatest interest—many, indeed, which are historical, and upon which the work of the most gifted artists has been lavished. But by all appearances the decoration bestowed upon nineteenth-century houses will bear comparison with the most elaborate efforts of the past.

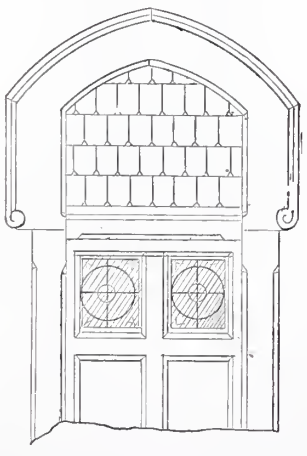
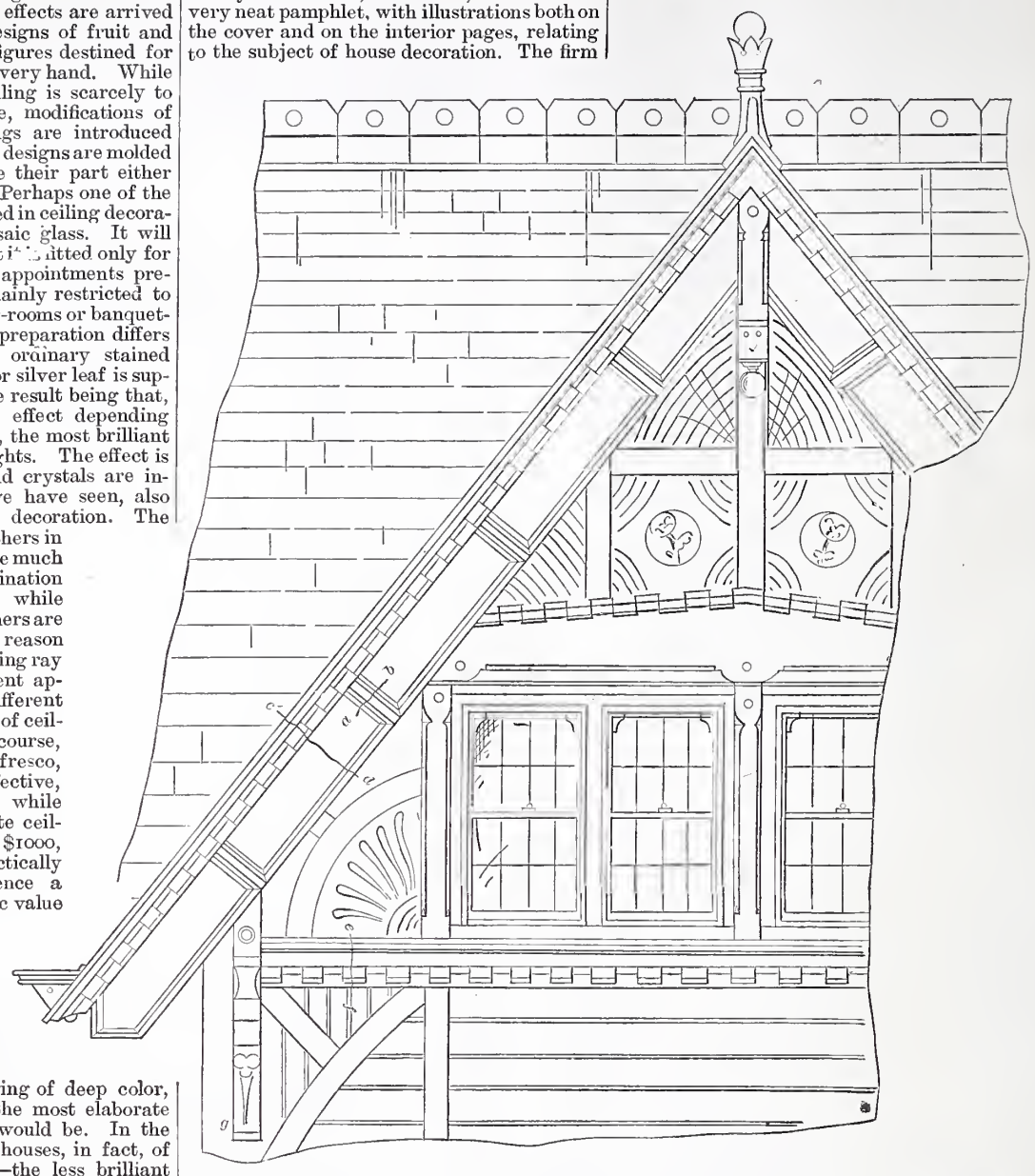


*Fig.* 10. — *Part Elevation of Principal Windows.—Scale, ½ Inch to the Foot.*

## Suggestions in Decoration.

Messrs. H. Bartholomae & Co., 124 West Thirty-third street, New York, have issued a very neat pamphlet, with illustrations both on the cover and on the interior pages, relating to the subject of house decoration. The firm named are manufacturers of wall papers, and have put forward this pamphlet in the way of an advertisement. It is quite artistic in its preparation, and contains much that will render it worthy of preservation. Those of our readers who are interested in the finish of interiors of dwellings will do well to possess themselves of a copy, which we understand will be sent free on application. Some portions of the text contained in this pamphlet, from the pen of William Watt, of London, are of sufficient interest to be reproduced in this place. Of course, we cannot show the engravings by which it is illustrated, a fact which detracts from the general utility of the quotation :

A house, to be a comfort and a pleasure, must possess two things—good light and plenty of fresh air. As, however, the plan and design of a house are properly within the province of an architect, we will not here attempt to show how good light and air can best be secured, or how rooms, halls, passages, &c., can best be arranged. Apart from the question of encroaching on the rights of a profession, the subject is far too large to be tied up in this little bundle of suggestions. Of one thing we may be sure—that no good decoration, no happy arrangement of furniture, can ever be achieved in ordinary houses where architectural features are extensively used and much multiplied. To furnish a home, four things should be considered—economy, utility, fitness or suitability, and beauty. We have no set rules for furnishing a home, for every man's house should not only be to him a castle for security, but a field for the display of individual taste, and through it of individual character. Form is only one thing connected with furnishing, and however important it is to have correct form, it is equally important and far more difficult to get correct color. If we but look to nature as our guide here, we shall do well. Take, for instance, the



*Competitive Design.—Fig.* 9.—*Part Elevation of Front Gable.—Scale, ½ Inch to the Foot.*

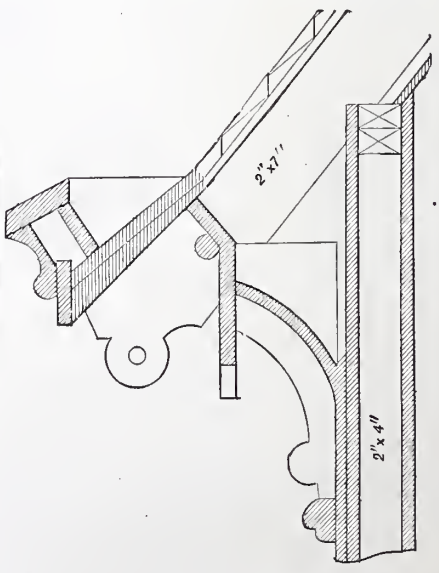
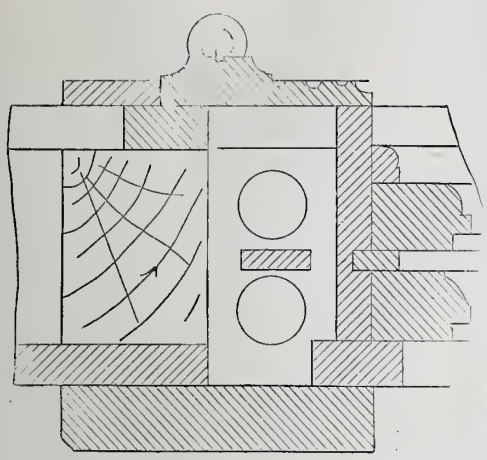



*Fig.* 11.—*Section Through Main Cornice. Scale,* 1 *Inch to the Foot.*

sky at sunrise or sunset, and study it for a few moments. We find no utility in it, but the blindest among us find some enjoyment, and to those who with keen sympathy notice it, how profound is that enjoyment! But when we turn to our homes, and see in house after house nothing, for example, but a constantly recurring chalky-white ceiling, we



*Competitive Design.—Fig. 12.—Horizontal Section Through Window Frames, Fig. 10. —Scale, 3 Inches to the Foot.*

may well think that in vain "day unto day uttereth speech, and night unto night sheweth knowledge."

Entering our home, the first impression we get of it is derived from the appearance of the hall and staircase. Whether it is a mansion or cottage, the entrance or hall first attracts attention, and from it may often be gathered the style of the whole house and the artistic character of its inmates. If we find in the hall either quaintness or grace, one or the other will be found developed

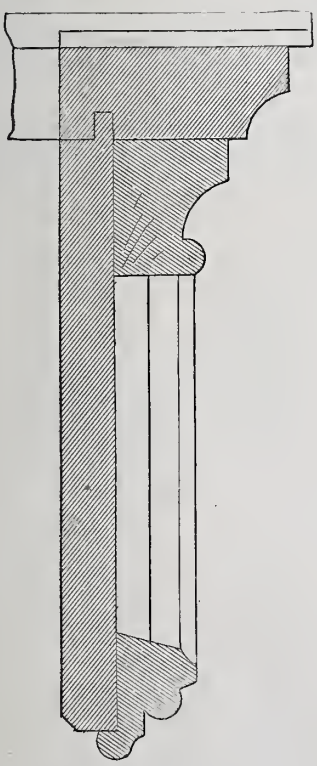


*Fig. 13.—Section on Line c d, Front Gable, Fig. 9.*

upon further acquaintance with the house. The walls of the hall should be of a warm or cool tint, according to the aspect; the floor should be of mosaic work, either fine work, like that called "opus Alexandrinum," or common mosaic, or inlaid slabs of marble. The furniture should be of a substantial character and made of oak or teak, designed and arranged so as to avoid anything like a crowded appearance. If the hall and landings are spacious, marble busts and statues may be placed in suitable positions with very good effect; but the pedestal or newel, though reasonably plain, ought to be something more than a piece of column or a boundary post. The carpet on the stairs, being exposed to much observation and wear, should be selected from the most durable in the market, and free from violent contrasts, such as white on dark red, or lemon on dark blue.

While we agree with those who uphold the English tradition that the dining-room should be substantially furnished, we are not satisfied with the usual practice of making the dining-room as heavy and dark as possible, and stocking it with carved chairs, sideboards and tables. We would suggest, not only for dining-rooms, but for most rooms, the use of polished oak floors, or at least a margin of 2 feet of polished floor against the walls. Thin parquet is now so made that it can easily be laid on ordinary pine floors with little trouble or cost. The grate or stove is always one of the leading features of a room; it should have as little iron as possible, and should be chiefly constructed of clay, terra cotta or tiles. The dining-room floor should have a rich carpet or a few large rugs. The walls should be broken by a dado, 3 feet or more from skirting, or even to the hight of two-thirds of the wall, according to one's taste, and the paper-hangings or decorations should gradually get lighter in tone toward the ceiling. This last-mentioned feature should be decorated. Papers can be used of patterns like those specially designed for ceilings. Gold-leaf should

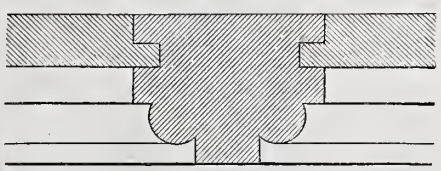


*Fig 14.—Horizontal Section on the Line a b, Front Gable, Fig. 9.*

be used in mass and well distributed, as in the Alhambra Court, or not at all. At the Crystal Palace we have been taught for many years how beautiful such a feature as the ceiling may become, no matter whether Egyptian, Greek, Byzantine, Moorish or Renaissance. The furniture should be of one color, but may be in two or more tones of the particular color selected. In some cases the sideboard may be adapted to the architecture of the room, and be built up as a fixture to balance the mantel-piece. All glitter of French polish or varnish should be avoided: if reflections are desired, let them be secured by polished metal or silvered glass. The window-hangings and *portières* might be made of some soft and thick material, and should either hang from a plain and small brass rod, only just touching the floor, or from a rod within a square-cut valance. We much prefer the soft light of lamps or candles to the usual large chandelier hung high up, which illuminates chiefly the ceiling.

The library ought to be furnished and fitted with the fixed intention to secure for this room as quiet and reposeful effect as is compatible with a full light, but carefully exclude all strong sunlight. Book-cases should be arranged so that the light may enable one at all times readily to read the title of every book in its place. The top shelf of a book-case should, if possible, always be within reach—that is to say, the under side of the cornice or covering shelf should not be more than 7 feet from the floor. One of the library tables should have a movable top with rack, as large folios require tilting up before we can read them comfortably. Large atlas works may be arranged in an atlas stand on large casters, so as to be easily moved. Plate-glass doors to book-cases are a mistake, as nothing looks so out of place behind glass as books do. Have a large table about the middle of the room, which you can load with folios if

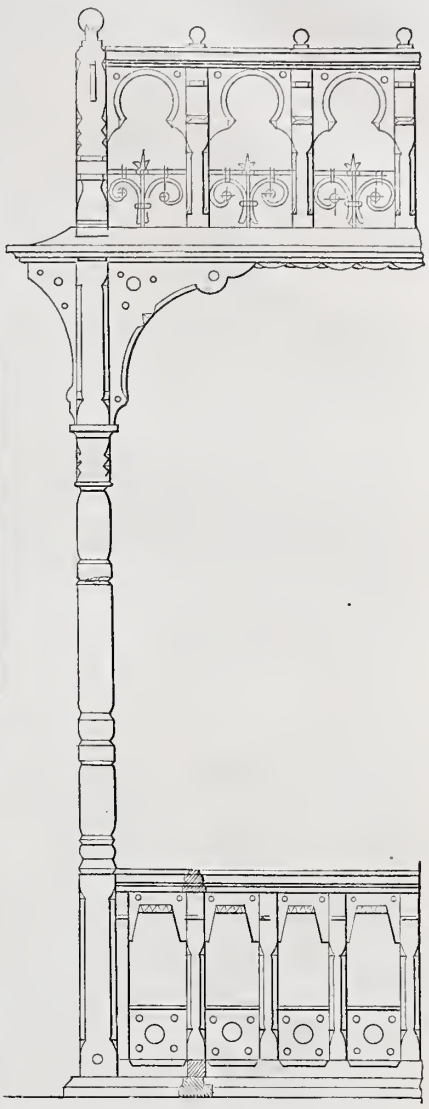


*Fig. 15.—Elevation of Porches.—Scale, ⅜ Inch to the Foot.*

necessary, or upon which you can place a stand for reference books, and have comfortable chairs and shaded lamps, with a thick *portière* over the door to deaden the sounds of the house.

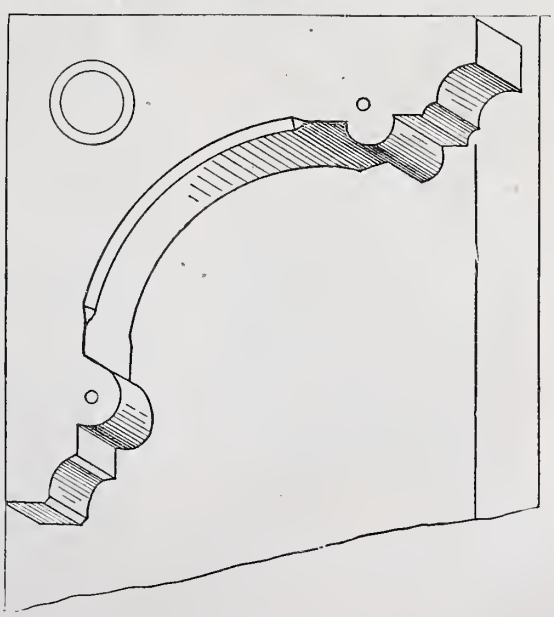


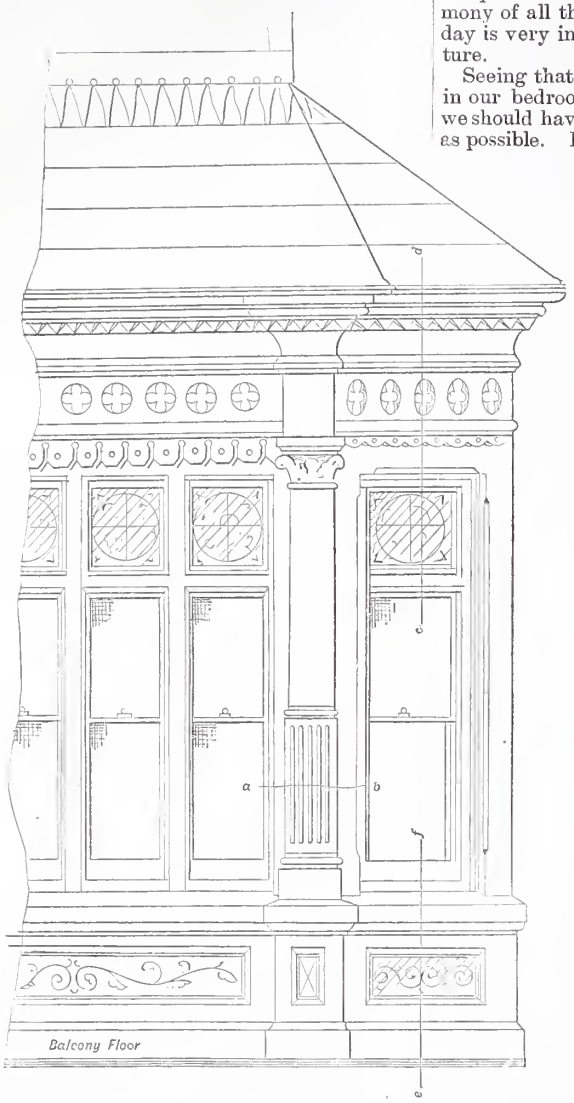
*Fig. 16.—Bracket at Angle of Bay on Side Elevation.—Scale, ¾ Inch to the Foot.*

While a certain preciseness is to be desired in furnishing a dining-room, the drawing-room admits of considerable freedom of arrangement. Here things that can lay

claim to grace, elegance and lightness should find themselves at home, and not, as is too often the case, "placed." The decorations may range from the very darkest to the very lightest key of color, but it may be taken as a tolerably safe rule that the contrast between walls and furniture should not be strongly marked. The carpet or rugs should be selected with due regard to the general scheme of the decorations. Warm colors on the walls may require reducing by patches of warmer colors in rugs, or masses of green or blue in carpets. The best plain Indian matting, warmed up by a few choice Persian or Indian rugs, has always a pleasant, refined look, if the furniture is not too dark. Although some of the cheap black furniture of the present day has a tendency to throw over this class of work a certain discredit, yet there are kinds of decoration not unworthy attention with which ebonized furniture will be found suitable. Do not have too much furniture, but let each article be complete in itself, and necessary to the harmony of all the rest. The gas of the present day is very injurious to fine decorated furniture.

Seeing that we pass one-third of our lives in our bedrooms, it is surely necessary that we should have them as healthy and cheerful as possible. Here we would strongly recommend polished floors, that the rugs may be taken up continually and cleaned. The ceiling and the upper part of the walls should be distempered in some plain light color, so as to be easily renewed. The furniture should be as light in construction as is consistent with the strength required, and made of light wood. Hungarian ash furnitrue, oak and satin-wood, are very suitable, or even American ash looks well and is much cheaper. Wherever possible, it is much to be desired on the score of health that furniture should always be made in such a manner as to be easily moved. It might well be raised clear of the floor, so as to avoid anything like dust-traps. For the same reason, flat-topped articles, as wardrobes, should be kept as low as practicable, that servants' labor may be saved, and the chance of dust accumulation reduced.

Much may be done to relieve the very dull and depressing outlook of most of our city windows by the judicious use of glass leaded up in patterns or set in fine woodwork of geometric design. Color and painted subjects may be introduced, but much caution is required to be used, for it is quite possible that the opposite side of the way may spoil the color, and almost obliterate the effect of the finer lines in the painted work. Where it is not wished to incur the expense of new sashes, leaded glazing can be fixed against the existing glass, either of sash or French casement, at a small cost. But fine mahogany framing, hinged like folding shutters, is a better plan if it can be afforded, as it has certain practical advantages not possessed by the ordinary leaded-up work, and is capable of more artistic treatment.




*Competitive Design.—Fig. 17.—Elevation of Bay Window.—Scale, ⅜ Inch to the Foot.*

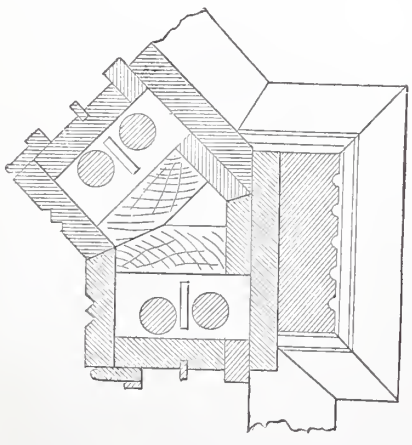


*Fig. 18.—Section on Line a b, Fig. 17.*

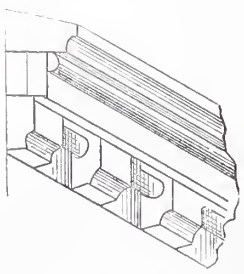


*Fig. 19.—Detail of Dentil Course Across Front Gable.*

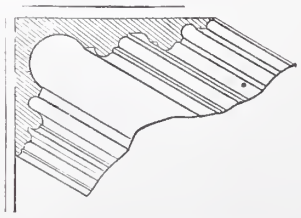


*Fig. 20.—Inside Cornice.*

## "A New Style" of Architecture.

The building papers are just now agitating the question, which periodically makes its appearance, of "a new style" of architecture. One gentleman treats at great length of the supposed need for such a style, and the impossibility of its being produced, because, from the nature of things, those that we have may be said to fill not only all the wants of the

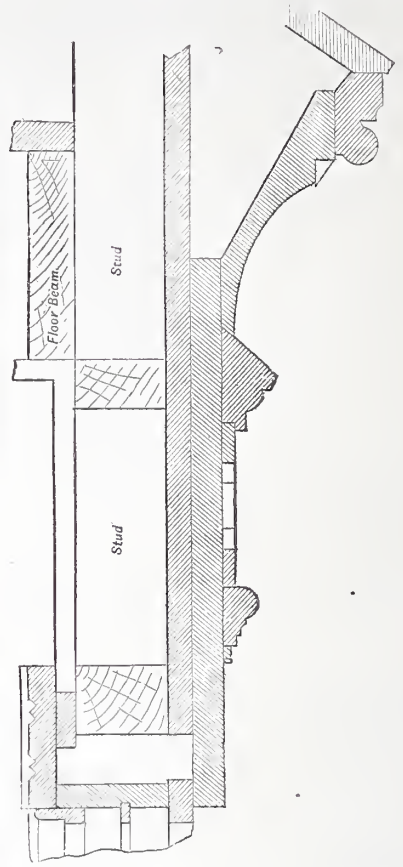



*Fig. 21.—Section Through Bay-Window Finish, Fig. 17.—Scale, 3 Inches to the Foot.*

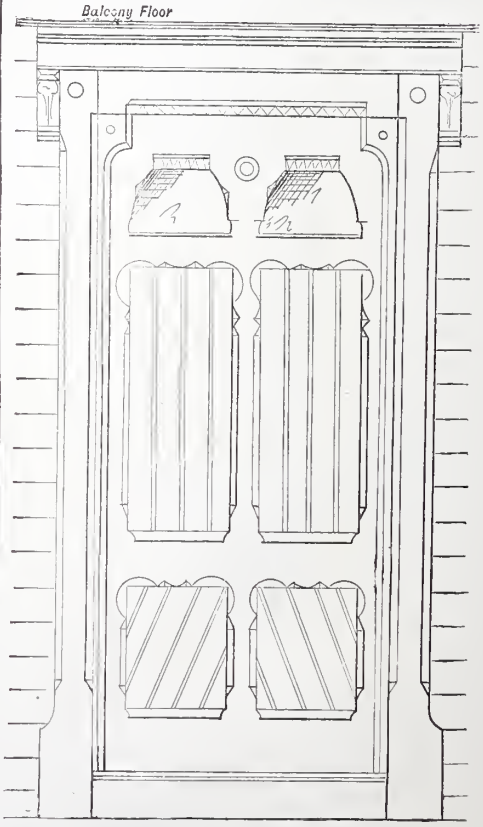
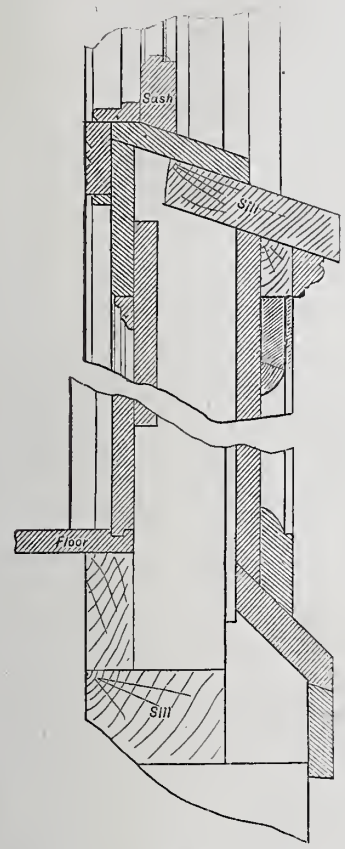



*Fig. 22.—Elevation of Front Door.—Scale, ⅜ Inch to the Foot.*

world, but all the conceivable methods by which buildings can be erected. If one must build in brick or in stone, and in building will work his materials constructively to the best advantage, we grant that a new style of architecture is an impossibility. When,




*Competitive Design.—Fig. 23.—Vertical Section Through Window-Sill and Water-Table.—Scale, 3 Inches to the Foot.*

however, a new material is introduced, we believe if its properties are different from those already employed, a new style is inevitable, whether it be sought for or allowed to

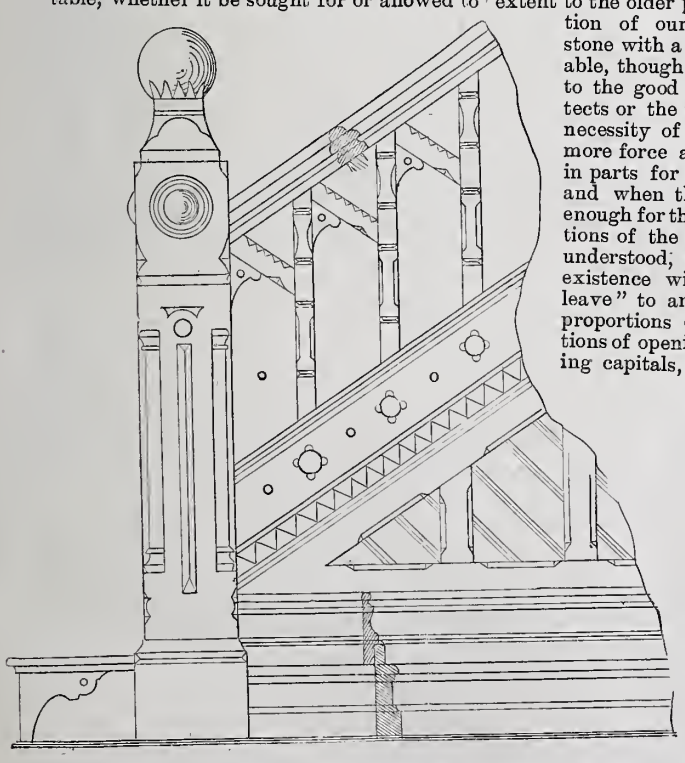


*Fig. 24.—Detail of Newel-Post and Finish of Main Stairs.—Scale, ¾ Inch to the Foot.*

grow itself. In Greek, Roman and Gothic architecture the peculiar forms developed resulted from the use of particular materials and by methods best adapted to their properties. So long as we use brick and stone, so long must we adhere very largely to the methods and styles which they develop. The necessity for larger buildings, the lack,

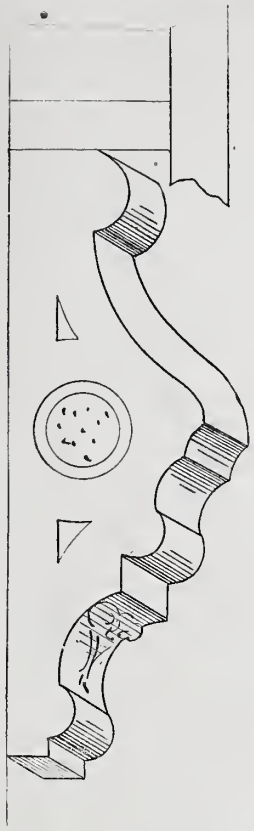


*Fig. 25.—Detail of Bracket of Front Gable, Fig. 9.*

for cost, of such a mortar as the Romans used, and ability to handle larger masses of stone than Gothic architecture used, will modify our buildings, but the features which constitute the individuality of the styles will be little changed. When we use iron and steel as building materials the style will change. Of course, as always happens, the new material is at first conformed to a certain extent to the older plans, and a large proportion of our iron buildings imitate stone with a fidelity which is remarkable, though not at all complimentary to the good judgment of the architects or the taste of the public. The necessity of the time will more and more force architects to use the iron in parts for which it is best fitted, and when this has been done often enough for the capabilities and limitations of the metal to be thoroughly understood, a new style will be in existence without saying "By your leave" to architect or builder. The proportions of columns, the proportions of openings, the method of treating capitals, the form of ribs, the treatment of wall curtains, ceilings—in fact, almost all architectural details—will be changed and proportioned anew to meet the capabilities of the new material.

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There appears at present to be a craze in Washington, D. C., for apartment houses, and the projectors believe they will all find ready tenants. If all the proposed plans are carried out there will be at least 10 of this class of structures put up before the close of the year. It is contemplated that one flat at least shall cater to a different set of tenants than those hitherto occupying flats in that city. The experiment is to be tried of renting the flat out in rooms—one or more, at the option of

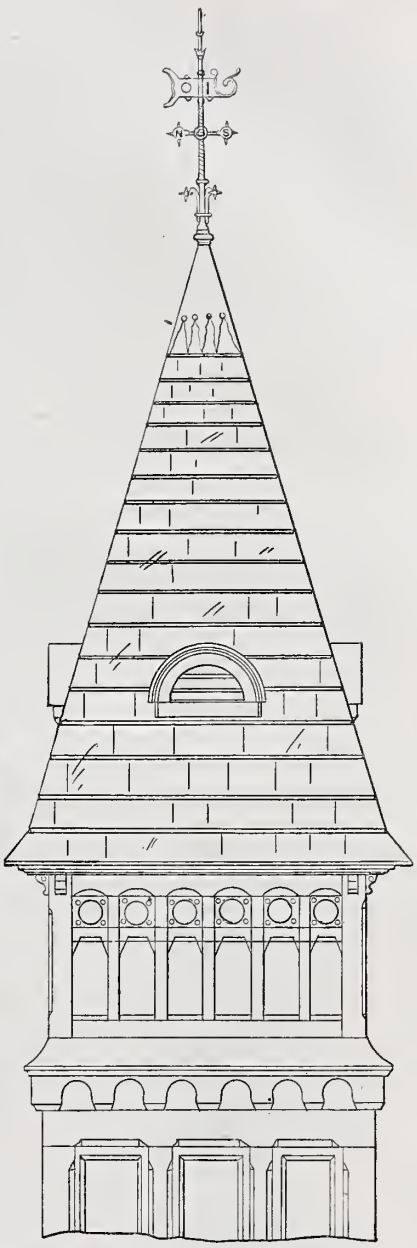

*Fig. 26.—Elevation of Upper Part of Tower. —Scale, ¼ Inch to the Foot.*

the tenant—and inducing that class of people who now live in rooms to take up their

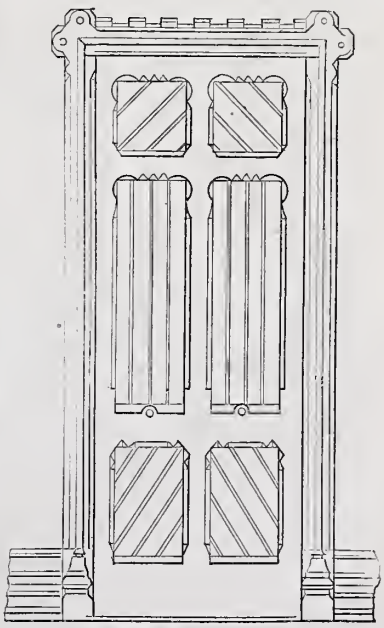

*Fig. 27.—Elevation of Inside Door and Door Trimmings.—Scale, ⅜ Inch to the Foot.*

residence in the flat. The rent will be moderate. A café will be attached, where meals can be served at popular prices.

## The Ninth Competition.

Up to the time of going to press, the committee to whom has been roferred the elevations and details received in the Ninth Competition have not made their report, and accordingly we are unable to give results in this issue. A very handsome lot of designs were received in this contest, the subject of which was tho elevations and details of a brick house to the floor plans that received tho first prize in the Fifth Competition. We expect to announce the prize designs in the next number of *Carpentry and Building*, and to commence the publication of some of the best of them either in that issue or the one following.

## Results of the Ballot.

The decision in the Tenth Competition, the subject of which was floor plans for a cheap seven-room house, was referred to our readers. In our last issue we requested that preferences among the 15 plans submitted should be indicated by means of the ballot blank that was printed among our advertising pages. From the fact that the March number of tho paper was a little later in mailing than usual, and that the day up to which votes were to be counted was fixed at only a little after the middle of the month, a comparatively short period was allowed our readers in which to inspect the plans and indicate their choico. The voting, however, was spirited, and despite the distance to be traversed in many cases, we heard from our subscribers in a total of 34 States and Territories, and also the Dominion of Canada. As might be expected, the portions of the country nearest at haud cast the largost vote, many of those living in remote places being deterred from voting at all, as they have subsequently written us, from the fact that it seemed impossible for their ballots to reach this office in time.

The names and addresses of the authors of the 15 sets of plans published in our last issue are as follows:

No 4. Geo. W. Townley, 314 Broadway, New York.

No. 15. James E. Mapes, Middletown, N.Y.

No. 35. Alex. Millar, 317 Thirteenth street, S. W., Washington, D. C.

No. 38. H. D. Winter, Wellesley Hills, Mass.

No. 41. Von Beck Canfield, 54 Division avenue, Brooklyn, E. D., N. Y.

No. 45. A. Watson, rear, 16 Pynchon st., Boston, Mass.

No. 50. G. B. Bower, Chatham, N. J.

No. 86. A. Van Horn, 398 First avenue, New York.

No. 92. A. H. Beers, 67. West avenue, Bridgeport, Conn.

No. 105. G. H. Young, 403 South Fifth street, Brooklyn, N. Y.

No. 107. Chas. A. Dean, 15 Studio Building, Boston, Mass.

No. 109. Chas. A. Dean, 15 Studio Building, Boston, Mass.

No. 126. L. P. J. Eckel, 159 Cedar street, Buffalo, N. Y.

No. 131. Theo. A. Richter, Jr., s. e. cor. Fifth and Walnut streets, Cincinnati, Ohio.

No. 138. B. C. Pond, 15 Pemberton Square, Boston, Mass.

The largest number of votes was given to No. 92 and accordingly the first prize, $50 is awarded to Mr. A. H. Beers, of Bridgeport, Conn. No. 45 received the second largest number of votes, and accordingly the second prize, $30, is awarded to Mr. A. Watson, of Boston, Mass. The third prize, $20, is in the same manner awarded to Mr. George W. Townley, of New York City, the author of the set of plans marked No. 4. We congratulate these gentlemen upon their success in this contest.

An analysis of the vote shows that the prize plans were not much more popular than some of the others. Of the entire vote the first prize received only 13.3 per cent.; the second prize follows it with 11 per cent., while the third prize received 10 per cent. The next in order of popularity was No. 38, which received a trifle over 9 per ceut. of the vote. Nos. 15, 105 and 41 follow each with 7 per cent. of the vote. The next in order are Nos. 107, 109 and 138, each receiving 6 per cent. of the vote. Nos. 126 and 131 each polled a little over 5 per cent. No. 86 polled 4 per cent.; No. 35, 2 per cent., and No. 50, 1 per cent. Referring now to the prize designs, the largest vote for the first prize in any one State, numerically considered, was New York, and yet it counted only 3 per cent of the entire vote. Following it is Massachusetts, which gave the first prize design 2 per ceut. of the entire vote. Illinois is next in order, with about the same percentage. The second prize design was most popular in Massachusetts—that is, it polled in Massachusetts the highest number of votes of any State from which we heard, the vote it received in that State being 3 per cent. of the entire vote. New York State gave this plan the second highest vote, while third in order were Peunsylvania and Michigan, each giving it the same uumber of votes.

No. 4 received the highest number of votes cast by subscribers in the State of New York for any plan. Had the result been determined by the votes received from this State alone, No. 4 would have received the first prize, No. 105 (being only four votes behind it) would have received the second, and No. 92, polling just one-half as many votes as No. 4, would have been third iu choice. New York cast the largest number of votes of any State. Next came Massachusetts, and theu in order named Pennsylvania, Ohio and Illinois. The decision, based upon the votes of Massachusetts alone, would have beeu as follows: First, No 45; second, No. 38; third, No. 92. Based upon the votes received from Pennsylvauia alone it would stand thus: First, No. 92; second, either No. 45 or No. 131, the votes being a tio; third, either No. 4 or No. 138, the votes in this case being also a tie. Ohio would have it as follows: First, No. 131; second, either No. 92 or No. 126 (tie vote); third, No. 38. Illinois showed her preference to be as follows: First, No. 92; second, No. 41, and third, either No. 86, No. 107, No. 126 or No. 138, all having the the same number of votes from the Prairie State.

The State of New York gave the third prize (No. 4) 6 per cent. of the entire vote, or over one-half of the entire number of ballots this plau received. New Jersey and Pennsylvania were a tie in the votes cast for this plan.

Referring to the vote as a whole, 9.1 per cent. came from Massachusetts alone, while the New England States collectively gave a total of 16.4 per cent. New York cast 27.9 per cent. of the entire vote, Pennsylvania, 9 per cent., while the Middle States altogether gave 42.4 per cent. of the entire vote. The Southern States cast 3.8 per cent., while the Western States gave 31.8 per cent. of the total vote. Ohio cast 7.4 and Illinois 6.2 per cent. of the entire vote. The Territories and the District of Columbia each gave a fair contribution to the total result. The Dominion of Canada sent in 4.5 per cent. of the entire vote.

From this brief analysis of the vote we do not know that any particular lessons are to be drawn, unless it be that results in a popular contest of this kind, with a generally acceptable lot of plans to select from, are very uncertain. The number of tie votes is certainly remarkable. As will be seen from the list of competitors, Eastern talent largely predominates, which, in view of the fact that the entries in this competition were from all parts of the country, would seem to indicate that Eastern architects and builders have given more attention to the designing of small houses than Western men. Subscribers in the State of New York voted in favor of every plan submitted. New Jersey gave no votes in favor of Nos. 35, 131 and 138. Pennsylvania cast votes for every plan except No. 50. In the Western States the vote was very evenly distributed.

One particularly satisfactory feature of the voting has been the number of letters accompanying the ballots, giving reasons for the choice indicated. A larger number of communications have been received in this contest than in any other one conducted by *Carpentry and Building*. Criticisms have been freely offered by our readers. Some have been very much pleased; others have expressed objections which in part grew out of local circumstances and in part were due to the tastes and habits of the writers. It would doubtless be very interesting to present in full the criticisms that have thus been sent in. It is manifestly impossible for us to do this. We can only refer to some of them, and present a few of the letters nearly complete. One feature that has been pretty generally criticised unfavorably is that of going through the pantry to the kitchen. Nearly all of those who have written us upon this subject have considered the trouble of passing through two doors from dining-room to kitchen as a matter of extra labor to the housewife. Perhaps this is a reasonable criticism when considered from the standpoint of a cheap seven-room house. Few architects, however, would plan a house of the better class without being careful to cut off by two doors the smells of the kitchen from the other parts of the house. A Pittsburgh correspondent gave it as his opinion that all of tho plans could be improved, although he did not particularize. Many letters indicated that our subscribers were unable to choose from among the plans presented without long study. Many have suggested how slight changes would make the plans still more serviceable. Back stairs in some of them aud an additional chamber have been frequently spoken of by those who have written us. A bedroom on the lower floor seems to be a general want in houses of this kind throughout the country, and we have letters from almost every State referring to this matter. A correspondent from Deerfield, Ohio, says that the entire number of plans presented show a series of rooms too large for storeboxes and too small for the rooms of a house. Unfortunately he does not give us any of the particulars that lead him to this conclusion. We presume, however, that he is accustomed to liviug in a house that has very large rooms, and that the section of country in which he resides makes it possible to build houses with large rooms very cheaply. We hardly think a majority of our readers will agree with this criticism.

A letter of commendation referring to No. 50 may be of interest to our readers. Accordingly, we iusert a portion of it: "I vote for No, 50 because it seems to me the cheapest looking, and because cheapness is the priucipal thing being aimed at in this competition. I also prefer it on account of the position of the stairs. If a house is only to have one flight of stairs, by all means let it be a back flight. It seems ridiculous to place the only means of access to the chamber floor that is for the use of the family where it will be of the least service to them, and of greatest service to visitors who are not expected to use it. I am not sure that, even granting two flights of stairs, this design is not preferable if the square staircase hall is tabooed, as evidently is the case in this competition. I am not a competitor nor a house builder, and in this matter I speak merely as a house occupant."

A correspondent from Winsted, Conn., has something to say about fireplaces: "I cast my ballot for No. 86 because I think it comes nearer to the word 'cheap' than any of the others. I would like, however, to hint to the author of this plan that in this neighborhood we do not put fireplaces iu cheap houses, nor put iu two chimneys where one could be made to answer the purpose. One more objection may also be mentioned. I find the average housekeeper does not like to have the pantry made a thoroughfare from the dining-room to the kitcheu, particularly if there are children in the house. This plan could be easily changed by making a passageway where closets are now marked. The plan has many good points, but the best is that it has a room on the first floor—namely, the library—that might be used as a bedroom. In looking over the plans I find that there are various ideas of how cheap 'cheap' is. When an effort is made to spell three or four fireplaces, a large hall, veraudas, sliding-doors and ornamental windows c-h-e-a-p, I am afraid the idea is not viewed in the proper light Some of the plans submitted, if mounted on wheels, would make good galleries for traveling photographers, or might be made to serve as Pullman sleepers or bowling alleys. I am not finding fault

with them, however, for if any one likes that kind of a house—why, these are just the houses he would like."

A correspondent, whose initials are G. G. J., makes some running comments as follows: "I have been looking over the seven-room house designs in the March number. The following is the manner in which they impress me: No. 45 has a gloomy living-room. I should want to sit in the kitchen if I resided in that house. No. 41 has got the pantry in the hottest corner in the house, and has too much hall. The same may be said of No. 105. No. 86 is a nice plan; I would like it to get the second prize. However, I do not like to go down cellar out of the dining-room, and I want a window in the pantry. In No. 50 the living-room is the gloomiest place in the house. I do not like to be obliged to go upstairs from the back hall. No. 131 has too many passages; it would wear out any servant's constitution to go from kitchen to dining-room. No. 109 is almost all hall, and contains a gloomy living-room. No. 138 has a hot pantry, and would be improved with a different shaped bay window. No. 38 has too much hall and another hot pantry. In No. 92 we are going to use stoves, and I want part of that chimney-room for a doorway between the kitchen and dining-room. In No. 4 I want the two closets between the alcove and back stairs for a pantry and the pantry for a coal-shed. However, this whole house is ill-proportioned. No. 126 has a red-hot pantry and a lonesome sitting-room. No. 15 has a sitting-room away off. I want a smaller closet, so as to give chance for a window in the pantry. No. 35 should have the cellar stairs moved. This plan shows an ill-proportioned house. No 107 has that gloomy living-room again. I pity the servant who has to sleep in the chamber specially provided during the summer time, unless the owner will consent to have the partition torn down between it and the refrigerator." From the above it would appear that this correspondent did not vote for any plan.

A correspondent from Kingston, Pa., writes as follows: "It is evident from an examination of the 15 sets of house plans that the committee selected as much of a variety as could reasonably be admitted to the competition. Nevertheless, there are a few that bear a very striking resemblance to each other, both in form and general arrangement. Nos. 45, 105, 50, 92, 107, 126 and 35, with but a few exceptions, are elegantly arranged. Of these, in all respects No. 105 is the best, and in my estimation is deserving the first prize. No. 131 may be considered as a set of plans failing to meet the terms or requirements of the competition. There is no pantry, and, in fact, a six-room house is shown. If the child's chamber, 6 feet 6 inches by 7 feet be counted a room, then, of course, it must be considered a seven-room house; but if this is so, why is not No. 38 an eight-room house? In it there is an alcove even larger, the dimensions being 7 feet 6 inches by 11 feet. No. 4 has a still smaller hall-room than the child's chamber in No. 131. No. 4 is also somewhat deficient for want of communicating passages between the kitchen and the other rooms. To compel the occupants of the house to pass through one room in order to get into another is a clumsy mistake. It is certainly too bad that such plans as Nos. 86 and 15 should each have a pantry without light. No. 41 presents an ill-divided second floor. By a simple change the living-room chimney could have been constructed plumb, and could have been used for two rooms, in which case the kitchen chimney might have been omitted. For the sake of economy, in No. 109 the chimneys between the living-room and parlor could have been confined more closely as one. In either case, chamber No. 3 would not be liable to suffer from overheating. Who could be more economical with chimneys than the author of No. 50, or less extravagant with bay windows than the author of No. 86? Different angles in the front bay would be preferable to those represented in Nos. 138 and 15. One commendable feature in many of the plans is their broad piazzas. With the exception of No. 126, all have pleasantly lighted dining-rooms."

How the fifteen sets of plans published in our last issue strike the fancy of our Canadian neighbors may be gained from the following letter, dated Ottawa, and signed "Non-Competitor:"

"An examination of the plans must, I am sorry to say, convey to any practical man but a poor idea of the abilities of American house designers, there being but one plan in the whole number free from such defects as would, if erected, cause the occupant to utter many a silent 'cuss' on the designer. The plan for which I give my vote as being the most perfect is No. 109, and this one, I consider, can be improved by starting the staircase a little further from the front vestibule (placing another step at top), giving room for hall-stove if required; by enlarging the lobby at end of hall, next to kitchen, and putting the doors to living-room and to cellar stairs from this lobby; by closing the door between parlor and living-room and between living-room and the kitchen; by increasing width of dining-room to 15 or 16 feet (length of dining-room is wrongly figured on plan); by increasing the length of kitchen, giving more width to pantry and kitchen closet; by reducing size of closet next to chamber No. 1 on first floor, thus increasing size of dressing-room, and by omitting closet to chamber No. 2 over porch below, and forming instead a closet in recess between chimney and hall-wall, thus giving more room for the bed in this room. The above alterations would, I consider, make this a good plan. To criticise particularly all the other plans would take too much time and space, but the objectionable and peculiarly American defect in house plans, that of having to pass through the dining-room from the kitchen to get to the front door, is shown in Nos. 26, 92, 15, 126 and 35, and in four of the above plans it is necessary, in addition, also to pass through the pantry *en route* to the front door—certainly a very bad arrangement to have to carry all the dirty water, &c., from the chamber story through the dining-room or through the dining-room and pantry. In Nos. 86, 50 and 107, to get at one room you have to pass through another, instead of each being accessible from a common hall. Some of the plans have the rooms too much cut up by doors, some rooms having as many as six and others five In several plans, the dining-room especially is too narrow, being only 12 or 13 feet wide, and in some cases with a fireplace to be taken from these widths. The halls and passages are in some cases too narrow, being in one case only 2 feet 9 inches wide. In the climate of the Northern States of America a front porch or vestibule is in all cases desirable. This several of the plans do not show. Another important point in designing—that of getting as far as possible the main supporting divisions over each other—is totally ignored in some of the plans. In the matter of stairs the number of steps from ground to first floor varies from 13 to 19, and in some cases sufficient head room is not allowed. There are many other minor defects in the plans which could be pointed out, but I trust these few remarks from an old hand at house designing will be taken in the friendly spirit in which they are offered."

The result of the ballot was reached so near the time of going to press that it has been impossible to arrange the details of the Eleventh and Twelfth competitions, as we want to conduct them, in time for publication in this issue. We expect to present full particulars in our next number.

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The United States Barge Office, situated at the Battery, New York City, is about finished. The building has a frontage of 108 feet and an average depth of 50 feet. The first story of the structure is 17½ feet in hight and the second story 16¼ feet. From the ground to the top of the stonework of the tower, situated at the easterly end of the building, is 74 feet. The hight from the ground to the peak of the roof is 86 feet. Surmounting this is a flagstaff 25 feet in hight. The structure is of Maine granite backed with brick, and is said to be fire-proof. The floors are yellow pine over brick arches sprung between iron beams. The roof is slate and copper over an iron skeleton. The building will be used for the outdoor business of the customs.

## CORRESPONDENCE.

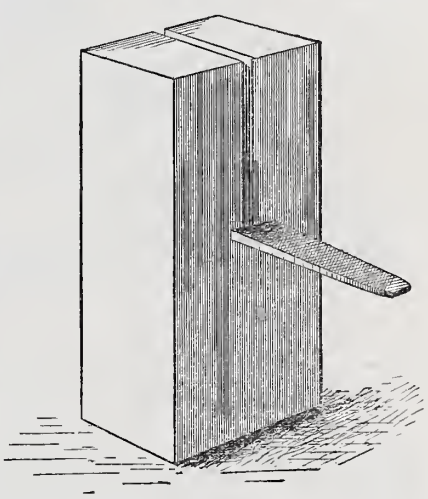
### Colored Putty for Plastering.

*From* R. S. R., *Wilmington, N. C.*—In answer to the inquiry of J. P. D., in No. 51 of *Carpentry and Building*, I would say that the following will probably answer his purpose: Slake lime to a thin paste. Strain through a fine flour sieve and add coloring in the fluid state to suit the taste. Thoroughly stir and strain into a hogshead, or some receptacle large enough to hold sufficient material for skimming one or more rooms. As the slaking and mixing of a sufficient quantity for the purpose may require several operations, let the whole hogshead be thoroughly stirred after being filled. Too much care cannot be taken to thoroughly stir this mixture, in order to prevent fine white particles of lime from showing after troweling. When the putty has become cold, apply with sand for plastering.

### Saw-Jointing Block.

*From* A. B. K., *Ottawa City, Iowa.*—I inclose a sketch for a saw-jointing block. I use a block 8 inches long, 3 inches wide and 2 inches thick. I rip the block 3 or 4 inches, according to convenience, and at the end of the saw kerf I mortise in an 8 or 10 inch flat file. By that means I can joint both sides of my saw teeth to a length, providing the file is in square.

A correspondent writing over the initials W. A. F., Lima, N. Y., sends us a saw-jointing device very similar to that described



*Saw-Jointing Block.—Device Used by A. B. K.*

above, save that he uses a three-cornered file in place of a flat file. He makes the statement that he has used this device for 12 or 13 years with entire satisfaction.

### Making Mortar.

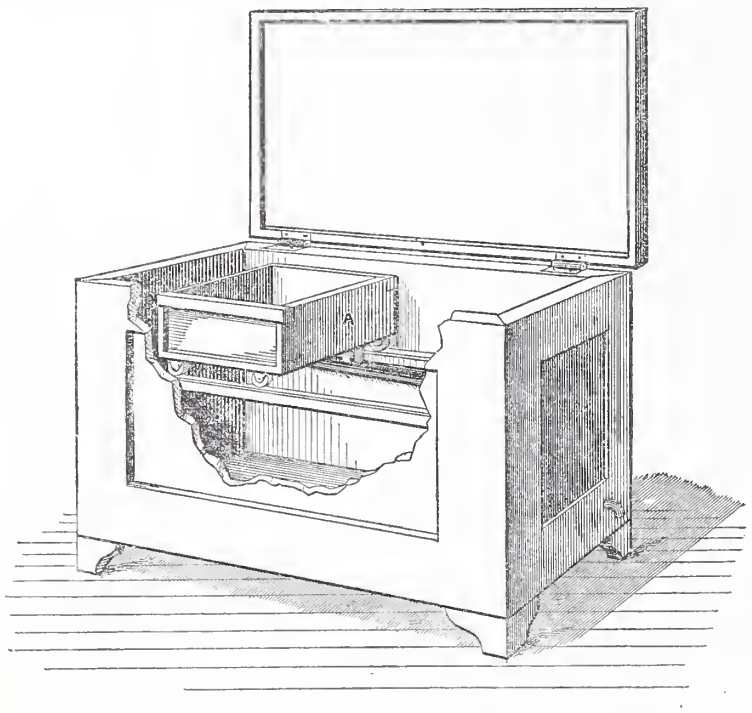
*From* E. A. N., *Rockville, Conn.*—In answer to the questions from A. W. B., who wants to know how to make mortar, I offer the following: First get enough, or nearly enough, water in the bed to slake a barrel of lime. Add more water as it is needed. When the lime is slaked put in the hair, having first thoroughly whipped and soaked it, leaving it over night in soak if possible. Mix till the hair is even in the lime, and then add sand till the mortar leaves the hoe clean when drawn out. Let it stand a week or longer in the pile. I think we save a third of our hair by putting it in after the lime is slaked, for the simple reason that it does not burn up as it would otherwise. We use from 10 to 15 pounds, according to quality. In practice I believe in having a scratch coat thoroughly dry before browning, and in having my lath green or wet to begin with. I always wet my lath in doing repair work, to keep them from twisting and to prevent drying the mortar too fast.

### Supporting a Chimney.

*From* L. A., *Alexandria, Ont.*—I desire to learn the best way of supporting a chimney from a floor. The building in question was

put up for a store, and a partition runs through it, cutting off space for an office at one end. In the center of the partition a door was left for entering the office, and the chimney was started from the second floor directly over this door. The inside rough framework was not built strong enough to support the weight of the chimney, and it springs the top of the door frame, so that the proprietor cannot shut the door. An upright post is at present placed in the doorway for fear the weight of the chimney may break down the woodwork. The chimney is about 23 or 24 feet in hight, and is 17 x 25 inches in size.

*Answer.*—Our advice under the circumstances would be to tear the chimney down from its present position and locate it where it could be run from the ground upward. The practice of building a chimney from the second floor instead of from the ground is bad in its general conception, and leads to bad results from whatever standpoint it may be viewed. Many fires arise from construction of this kind, and the difficulties of which this correspondent complains are small compared with some results that occasionally follow such construction.



*Making an Ice-Box.—Construction of Ice-Chest Described by R.*

### Making an Ice-Box.

*From* R.—In answer to A. B., whose inquiry appeared some time since, I will tell you what I know about building a grocer's ice-box. I had two customers who have old chests. I took out the old zinc, then got out two pieces of wood 2 inches wide and 1 inch thick, and nailed them on to the inside of the chest, high enough up so that butter jars would set in beneath them, and the ice-box slide over each jar. On the top of the strips I put a piece of iron ⅛ inch thick and 1 inch wide, and screwed it down upon each side. I then got a board 12 or 14 inches wide and long enough to go across the width of the chest. On the corners of this I put four trunk casters. I now had a box without sides. The ends were about 10 inches deep On each side of the chest we nailed a strip 1 inch deep for the ice-box to run on. That gave us an ice-box like A in the sketch. In this I put an outlet, and on the top of each side piece I nailed a strip 2½ or 3 inches wide to hold the ends and also the ice, and lined the whole with zinc. I made a small tin gutter and nailed it on under the strip on one side of the ice-chest. This gutter had an incline with an outlet at one end. The ice-box was then put in on to the side strips, with its outlet over the gutter, and, as you will understand, it plays backward and forward from end to end of the chest, while the outlet delivers into the gutter in whatever position you may place it. Of course, you can get at anything there may be in the chest by sliding the box to one side or the other, like a till in a chest. Where the old chest used 200 pounds of ice per week, my pattern takes only 50. While I do not consider myself an authority on the construction of ice-boxes, and leave it for others to discuss, I think the old ice-chests altered in this way take the cake. Hoping this may be of some benefit, I send it along.

*Note.*—We are very glad to get our correspondent's suggestion. He seems to have made a box which for convenience leaves little to be desired.

### A Steam Heating Experiment at Bridgeport, Conn.

*From* ALFRED HOPKINS, *Bridgeport, Conn.*—Your letter asking for a description of the steam heating and ventilating of the new high-school building in this city at hand, and I cheerfully comply with your request. The heating and ventilating may be termed a new departure from any method heretofore used, and is known as the "Wheeler System," invented by Mr. Nathaniel Wheeler, president of the Wheeler & Wilson Sewing Machine Company, and who, I consider, has the best practical knowledge of heat and ventilation of any man in this country. The building contains about 400,000 cubic feet of air, and is divided into 14 schoolrooms of about 14,000 cubic feet each, one large assembly hall of about 100,000 cubic feet, and three main halls of about 20,000 feet each, also janitor's room, workshop, reception-room, library, office, &c.

The building is heated entirely (library and reception-room excepted) by indirect radiation. The indirect coils are made of 1-inch pipe, known as "box coils." Each room has its own separate heating coil, which is divided into three or four sections, so as to give any degree of heat that may be required. Thus, if the thermometer indicates, say 35°, turn on one section; if 20°, two, and so on. Then, as the room becomes warm, turn off one or more. The coils are each inclosed in a galvanized-iron jacket from which a hot-air pipe leads direct to its particular room, and only one register to each room, except the assembly-room, which has four registers. The pipes are large; for the first floor equal to 30 inches diameter; second, 24 inches; third, 24 inches to assembly-room and 20 inches to schoolroom. There are four cold-air boxes, two on the east and two on the west sides, about 4 feet square each. These are carried up about 15 feet above the ground and covered over, the air being brought in on two sides at the top. The registers are of the full area of the hot-air pipes, and are used in summer for overhead ventilation in this way: A cap or cover is on top of register-box, which is taken off and set in the hot-air pipe where it enters the register-box, and which lets the air from the room flow direct into the ventilating shaft. The outlet or ventilating flues are double the size of the warm-air registers.

The heat is brought in on the warm side of the room, on the inner side, in the corner. This corner is cut off for 6 or 8 feet, so as to bring the register opposite the outside corner. The hot-air pipe is carried directly to the top of the room and the cold-air and ventilating outlet is directly under at the floor. The teacher's platform is above this opening, about 12 or 15 inches, and the foul air passes under to the ventilating shaft. There are four of these ventilating shafts situated near the center of the building, two on each side of the lower hall, and about 20 feet apart. They contain the heating coils, hot-air pipes, smoke-pipes for boilers, soil and water pipes, and two of each are brought together by an arch in the attic and carried through the center of roof. They are 10 x 14 feet square on top and about 110 feet in hight. Just above the arch, where the two shafts unite, there are four dampers, two for each side, to shut off the cold air at night and to regulate the flow of air. They also keep the heat from escaping at night, which is generated from smokestacks (there are two 24-inch wrought-iron pipes) the steam not being kept up at night; also, what heat may come from the supply-pipes to the heating coils, which is utilized for heating the rooms through ventilating shafts at floor This heat is used in the daytime to assist in ventilating. The heating surface is 1 foot to 30 cubic feet of air in the northeast and northwest rooms, and 1 to 40 in the west, except the halls, which are 1 to 60 or 70 feet, the remainder being made up of the foot warmers placed in between the floor timbers, covered over by perforated iron plates, which measure 16 x 96 inches; there are 14 of these.

The heating and ventilating of this building is a complete success in every respect. It has been examined by some of the best experts in the country, and when we show them the thermometer on the outside walls, between the windows, from 1° to 4° higher than on the inside walls when the warm air is brought in, they are somewhat astonished, and we can show this in any weather. We change the air in the schoolrooms six times every hour, which gives as pure air as can be desired. The coldest weather we have had this season was 4° above zero, and we have no trouble in heating the coldest room in two hours' time. We have two 60-horse-power horizontal boilers, but have found it necessary to use both but a few days as yet. We have also an 8 or 10 horse-power horizontal boiler, which is to be used for summer ventilation to connect with the large ventilating shafts, which each contain 500 feet of 1-inch pipe near the top, and each of the four ventilator shafts for the water-closets. These shafts are about 100 feet high, and each have two 1-inch pipes that run the entire length, which insures perfect ventilation. As to the amount of coal consumed, I should judge we have burned about a ton a day since October 1st, when the school was opened. I shall be pleased to show the working of this new departure to any of my friends at any time, if they will come to Bridgeport, and they may select as cold a day as they wish.

### A Study in Suburban Architecture.

*From* ARCHIE III, *Boston.*—The letter from "Another Architect," in the March issue, relative to the series of papers you are publishing on a "A Study in Suburban Architecture," was quite to the point, and certainly contained some very just criticisms on the work in question. But there are still some inexplicable features of the drawings illustrating the papers, to which I would like to call attention.

In the January number were published the plans and front elevation, as perfected by the united efforts of Mr. and Mrs. Archie. A glance at the elevation will show that the sitting-room chimney is entirely omitted, and not only that, for a reference to the east elevation, published in the February number,

shows that the corner and the roof of the gable of the projection in the sitting-room would also appear in elevation behind the library bay. As the addition of these somewhat troublesome members of Mr. Archie's house would detract very much from its appearance in front elevation, it seems hardly fair that the mistake should pass unnoticed.

The damaging effect of this corner might be easily overcome, and with benefit to the plans as well as elevations, according to my mind. The only excuse for a projecting corner is to get the full view in that particular direction, but here we find a large chimney placed exactly in the middle of this bay, where we would naturally wish to look out, and seats are thoughtfully provided for us to turn our backs to the view, and so placed that we cannot see the fire either. It seems to us that the interest in the house would be greatly increased if the east and south sides of the sitting-room met frankly and naturally at right angles to each other, thus dispensing altogether with this unwieldy projection; but if it is to be retained, let us see it in the drawings or be told why we cannot see it.

### Strength of Cypress Timber.

*From* D. C. Barrow, Jr., *University of Georgia, Athens.*—Below I send you the result of some tests on the strength of cypress. These tests were made by our students in engineering under my direction. The pieces were well seasoned and carefully selected specimens. The machine used was made by Messrs. Riehlé Bros., Philadelphia.

CRUSHING STRENGTH.

*Crushing load per square inch in pounds.*

| Red cypress | | White cypress | |
|---|---|---|---|
| No. of experiment. | Load. | No. of experiment. | Load. |
| 1 | 5,377 | 1 | 5,011 |
| 2 | 5,428 | 2 | 4,943 |
| 3 | 5,367 | 3 | 5,209 |
| 4 | 5,619 | 4 | 4,943 |

TENSILE STRENGTH.

*Breaking load per square inch in pounds.*

| Red cypress | | White cypress | |
|---|---|---|---|
| No. of experiment. | Load. | No. of experiment. | Load. |
| 1 | 5,182 | 1 | 7,340 |
| 2 | 4,390 | 2 | 7,466 |
| 3 | 6,250 | 3 | 6,846 |
| 4 | 5,576 | | |

TRANSVERSE STRENGTH.

*Coefficient of breaking strength in pounds.**

| Red cypress | | White cypress | |
|---|---|---|---|
| No. of experiment. | Coefficient. | No. of experiment. | Coefficient. |
| 1 | 437 | 1 | 340 |
| 2 | 400 | 2 | 397 |

* See Trautwine's "Pocket-book," pp. 183 to 185.

### Spiral Screw-Drivers.

*From* E. W. G., *New York.*—Please inform me of a place where I can buy a patent screw-driver—one that you don't have to turn your hand to turn the screws. I do not mean a ratchet screw-driver; I mean a spiral screw-driver. I never saw but one in my life.

*Answer.*—Our correspondent will probably find what he wants at Peter A. Frasse's Fulton street, New York City.

### Bits for Molding Planes.

*From* D. E. S., *Philadelphia, Pa.*—Will you please inform me through *Carpentry and Building* how I can get the pattern for a bit to make a molding of a given form? I am running a wood-working machine, and this is one of the things I have not yet learned.

*Answer.*—If our correspondent will refer to letters printed and answered in our April and June issues for 1882, he will probably find therein all the information he needs to answer his question and anticipate others.

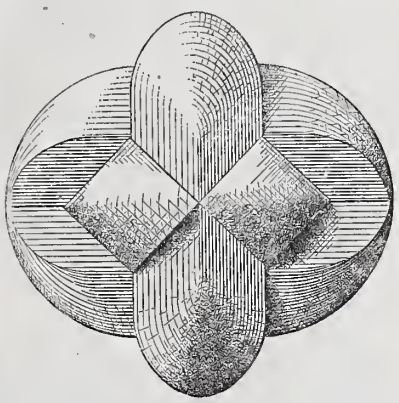
### Practical Framing.

*From* H. A. K., *Westerly, R. I.*—Allow me to suggest to *Carpentry and Building* a series of illustrated articles on practical framing, to be commenced as soon as space will permit. I think such a series would be fully appreciated provided it came from a praetical man of acknowledged ability in this line.

*Note.*—We shall be pleased to publish such a series of articles in *Carpentry and Building*, and any of our readers who feel competent to supply material of this kind are invited to correspond with the paper. Our correspondent very fully describes the character of matter that we want, and a series of articles embodying this idea will be liberally paid for.

### A Wooden Puzzle.

*From* K. O. A., *New York.*—I desire to call attention to a puzzle that is quite neat in its general appearance, and which some of the younger readers, at least, of *Carpentry and Building* may be disposed to whittle out in their moments of leisure. It consists of six pieces, two of which are cut to the shape shown in Fig. 3 of the engravings, three of which are of the shape shown in Fig. 5, while the key is of the character shown in



*A Wooden Puzzle.—Fig. 1.—View of the Puzzle with the Parts Combined.*

Fig. 4. Fig. 2 illustrates the shape of all the pieces, being diamond or lozenge in form. The shapes shown in Figs. 3 and 5 differ from each other in the fact that Fig. 3 has a notch on the side, while Fig. 5 has only the two edge notches. The general appearance of the puzzle when put together is shown in Fig. 1, while Fig. 6 shows how to commence arranging the pieces. One of the pieces like

*Fig. 2.—Section Through the Several Pieces.*

Fig. 5 is taken in the fingers, while a second one of the same form is placed in the lower notch. A third piece like Fig. 3 is laid across the two, while opposite the first piece another one like Fig. 5 is used; then the remaining piece like Fig. 3 is laid across the opposite side, after which the key, as shown in Fig. 4, is slipped into place. I know of still another puzzle somewhat similar to this in character, which I may present on a future occasion. It is more intricate than the one here shown, and altogether is much more of a puzzle.

### Writing Feet and Inches.

*From* J. B., *Loudersburgh, Pa.*—As regards the method of writing feet and inches, I think in all written specifications or the

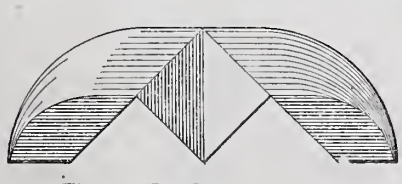


*Fig. 3.—Two Pieces Like This.*

like they should be written "feet" and "inches." In a figured drawing it should either be abbreviated to "ft." and "in." or '—", with a dash between. I do not agree with the remark in the March number, that 20 inches should be expressed 1 foot 8 inches; as the distance is so short, it is more convenient to mention the whole number of inches. As the 2-foot rule is in most common use for measuring such distances, I think it is more convenient to name all distances not exceeding 2 feet in inches, and those over 2 feet in feet and inches.

*From* W. I. T., *Oncida, N. Y.*—In answer to your correspondent H. S. E., I wish to

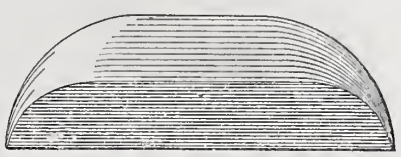


*Fig. 4.—The Key Piece.*

say with regard to the method of writing feet and inches that if written thus, $^{2}/_{4}$, $^{6}/_{10}$, &c., no error can possibly occur. Especially is this method to be preferred in making out bills of doors, sash, blinds, &c. I admit that in a neatly-drawn plan the usual prime marks look the best, yet there is no limit to errors where these are employed.

*From* J. C. Rankin, *Mt. Vernon, N. Y.*—Referring to the correspondence in the March issue of *Carpentry and Building* with reference to the method of writing feet and inches, I beg to say that at school I mastered the mystery of duodecimals and learned its arbitrary signs. I have since found but little fault with them, barring the fact that decimals without the "duo" would have been vastly more convenient. I then learned that 1′ is 1-12th foot, that 1″ is 1-12th of 1′, or 1-144th foot, and 1‴ is 1-12th of 1″, or 1-1728th foot, &c. Now, the correct expression of 3 feet 8⅛ inches multiplied by 6 feet 4⅞ inches by this rule would be 3 feet 8′ 1″ 6‴ x 6 feet 4′ 10″ 6‴. It would be necessary to state the problem in this manner in order to perform the operation of multiplication by the duodecimal system. For the purpose

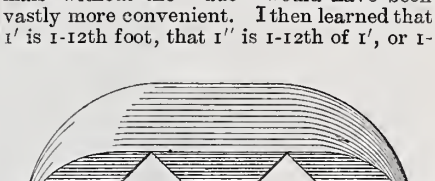


*Fig. 5.—Three Pieces Like This.*

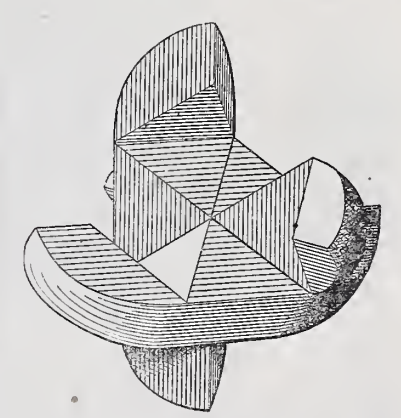


*Fig. 6.—The First Three Steps in Combining the Pieces.*

of indicating dimensions only it might be written 3 feet 8⅛′ x 6 feet 4⅞′. I would suggest as an improvement on the sign "ft." the readier indicator †. With this the above dimensions would be written 3† 8⅛′ x 6† 4⅞′.

*From* G. J., *Trenton, N. J.*—All the books I have ever seen use the marks ′ ″ ‴ to indicate some power of 12; thus 7′ equals 7-12ths foot, 9″ equals 9-144ths foot, &c. In substantiation of this I might refer to Bryant & Stratton's Business Arithmetic, pages 157 to 159, and to Brooks's Normal

Written Arithmetic, also to Davies's Practical Mathematics, and to many other books where the symbols are used. I have never seen a book—or rather, the writer of a book—that did not use "ft." and "in.," or "ft." for feet and ′ for inches. If my boss desires me to build a door 6 ft. 6′ x 2 ft. 4′, writing as above, or 6′ 6″ x 2′ 4″, which of the two ways is correct? I think the first is preferable, because it is the plan used by all the authors of books. Thus, 6 ft. 6 in. or 6 ft. 6′ should be the rule. If 6′ 6″ for 6 feet and 6 inches, it is at varianee with all published authoritics. In the Mareh number of *Carpentry and Building* the method of writing feet and inches given by H. S. E., Albany, N. Y., is not correct, referring to the books for authority.

*Note.*—In this ease, as in some others that might be meutioned, it unfortunately happens that the authorities, using this term now to indicate authors of books, do not agree with eommon practice. The makers of arithmeties, when dealing with the duodecimal system, have devised certain signs aud symbols to indicate fraetional parts of a foot, as our eorrespondent sets forth. Meehanics and engineers, on the other hand, by the same process of development have used similar symbols to indicato feet and inehes, not in the same sense, however, that the same symbols are used in the arithmetic. It is hardly fair to either party to quote the opposite to prove that the one is wrong. No meehanic or engineer would thnk of using the duodeeimal system in praetiee, and those who employ the duodecimal system in ealculations have very little to do with the writing of feet and inches in the way that mechanies ordinarily use these dimensions. As expressed in a former issue, there is unfortunately a muddle in this mattor and many mistakes occur through carelessness upou the part of those who put the dimensions down, as well as by reason of a misunderstanding of the signifieance of the symbols employed. We shall be glad to have this question further discussed in our columns, to the end that all may be enlightened upou it.

### Directions for Building a Kitchen Chimney.

*From* J. M. R, *Boston, Mass.*—The eousiderations in the construction of a kitchen chimney are a good draft, a thorough ventilation, safety fr fire, and eeonomy of spaee. The following directions have been prepared with these points in view: Start from the eellar with a wide brick foundation. From the kitehen floor build two good-sized flues, one for draft to operate the cooking apparatus and the other for ventilation. Build both flues to the full hight of the chimney. Briek is best for the front wall of the kitehen ehimney, whieh should not be less than 3½ feet wide, with a breast 6 feet high. The funnel hole should not be less than 3 feet from the floor. Set a good portable range elose up to the brick front, with an elevated iron shelf over the range. Make an opening 12 x 2 inches into the ventilating flue over the fire end of the range, to be used as needed. It should be near the under side of the shelf, and is ealculated to take off the steam and smoke from the kitchen. This arrangement combines all the advantages of a brick-set range, while the expense for fuel will be less than one-half that required for operating a briek-set range. My new house has the above described improvements eomplete. There is no patent applied for. The additional expense of buil ing the ehimney with these improvements is very small.

### Boring a Square Hole.

*From* M. & Co., *Pittsville, Mass.*—In the January number of *Carpentry and Building*, page 19, under the head of "Boring a Square Hole," the assertion is made that a boring maehine is in the market with a chisel attachment that makes a square hole. Please give us the address of parties dealing in or manufacturing such a machine.

*Answer.*—The impression seems to prevail in the trade very generally that a machine of this kind is in existence, and inquiry at a number of establishmeuts revealed the fact that, though no one could tell just where it was made or by whom sold, yet every one was positive that he had seen sueh a maehine. After more than ordinary care in searehing for the iuformation our correspondent wants, we are disposed to refer the question to readers of *Carpentry and Building* for further a.tentiou. We shall be glad to learn the names of manufacturers of a maehine of the general kind described.

### Disposition of Extra Steps.

*From* J. H. R., *Corry, Pa.*—I find in lookiug over the paper that E. C. S., of Oshkosh, wants to know what to do with two extra steps in his quarter-wind stairs. Let him put in 20 risers 8¼ inehes high and 19 treads 13 inches wide. With this arrangement I think he will get up all right.

### A Critic Criticised.

*From* "SMILAX," *Portland, Me.*—W. M., of Aurora Springs, Mo., very sympathetically offers to help D. M. W., but he is not any better off than the man to whom he generously offers his assistance. He defies all the arehitects in the country. The best thing he ean do is to take a few lessons in square root, and he will find that 6 feet rise and 9 feet rise gives 10 feet 9.79 inches, instead of 10 feet 10 inches, as he intimated, 6 foet being one-third the width, whieh makes one-third the piteh. Being a "wood butcher" myself, I object to the ridicule whieh W. M. brings upon the craft.

## REFERRED TO OUR READERS.

### Brick Veneers.

*From* V. T., *Boone, Iowa.*—During the year 1882 my attention was ealled to a store building the brick veneering of which was being taken down. I noticed that the boards and studding were quite rottcu, espeeially near the ground. I desire to ask the practical readers of *Carpentry and Building* if this is characteristie of wooden buildings veneered with briek. I shall be glad to see answers from those who have had experienee. Information of this kind is of advantage to the general public.

### Saw-Filing Gauge.

Several of our eorrespondents desire to kuow the name of the saw-filing gauge described in the January number of *Carpentry and Building* by E. F. D., of Stantontown, Ohio, and by whom made. If our correspondent will forward this information we shall take pleasure in laying it before our readers.

### Coloring Plaster.

*From* M. A. C., *Cincinnati, Ohio*—Will some practical reader tell me what colors may be used in the skim eoat of plastered walls which will not be affected by the lime? Information with regard to this kind of finish in general will be very aeeeptable.

### Geometrical Rule for Dividing a 90-Foot Pole.

*From* J A. G., *Hornellsville, New York.*—Will you allow me to ask R. M. P., of La Crosse, Wis., or some one else, to demoustrate geometrically the rule giveu in a receut number of *Carpentry and Building*, for dividing a pole 90 feet high so that wheu broken the top would fall 30 feet from the base. R. M. P. says square 90, also 30, and subtraet; then divide their difference by twice 90. My method of solving this question is square 30 aud divide by 90, the quotient being 10, whieh is the differenee of the two uumbers; 90 being their sum, 50 and 40 are the respective lengths of the other two sides of the triangle. The reason for this rule is the world-known mathematical formula that the product of the sum and difference of two numbors is equal to the differ ence of their squares. It follows, therefore, that if the difference of the squares of two numbers be divided by their sum, the quotient will be the other factor, which is the difference of the two numbers.

## STRAY CHIPS.

ON PRAIRIE AYENUE, near Twenty-ninth street, Chicago, Ill., Mr. Burch will erect a private residence, 40 x 65 feet in size, and estimated to cost $20,000. The building will be of brick, with wood gable, and constructed in the Queen Anne style of architecture.

THE ECKSTEIN WHITE LEAD CO., of Cincinnati, Ohio, have lately made contracts for the erection of new and extensive works on Freeman avenue. Messrs Stewarts' Sons are the contractors. The plans were prepared in Chicago, and the estimated cost is about $100,000.

A NEW Presbyterian church has just been completed in St. Louis, costing $30,000. It faces Lafayette Park, and is called the "Park Church." The walls are st ne, in broken ashlar. The pastor's study, Sunday-school rooms, parlors, &c., are in the basement, and the main audience room above. Rev. D. C. Marquis is the pastor.

THE COMMITTEE of Allegan County, Mich., appointed to select a plan for the new county court house, have adopted with some modifications the plans submitted by architect Lohman. The structure will be 50 x 100 feet, 24 feet in hight, with 9-foot basement. The material used in its construction will be brick, with slate roof. The cost is not to exceed $10,000.

MESSRS. MAYBERRY & SON, architects, of Winona, Minn., have completed the plans for a new court house for Houston Co., the building to be located at Caledonia Mines. The contracts for lime, rock, sand and brick have already been let. The contract for building and furnishing other material will be let during the present month when the County Commissioners meet. The estimated cost of the building completed is $30,000.

MR. THEODORE A. RICHTER, JR., architect, of Cincinnati, Ohio, is preparing the plans for a 10-room frame house for Mr. I. B. Weller, at Troy, Ohio; for an 8-room frame house for Mr. I. F. G. Bentley, at Springfield, Mo., and for an 8-room brick house for I. B. Marling, at Norwood, Ohio. Mr. Richter states that the patronage of these parties was due to his prize design published in the September number of *Carpentry and Building* for last year.

THE NEW ESTABLISHMENT of Mr. Henry F. Reh, of No. 320 Twelfth street, northwest, Washington, D. C., has just been completed. The building has a frontage of 24 feet 9 inches and a depth of 83 feet. The front is of ornamental brick, with brick cornice and heavy ornate galvanized-iron cornice over the show windows of the store. The structure contains 15 rooms, the storeroom on the ground floor being 17 x 40 feet in size. The cost is estimated at about $7000. Mr. Charles Heldt was the contractor.

MR. ANDREW J. WHITE is the owner of the dwelling-house, now nearly completed, on the corner of Fifth avenue and Sixty-sixth street, New York City. The building covers a lot 27½ feet wide by 100 feet deep, and is four stories, with basement, in hight. The style of architecture is French Renaissance. The materials used for the exterior are Jersey gray rock and Philadelphia brick. The roof is of slate and copper, with stone dormers. Mr. J. E. Ware was the architect under whose supervision the building was erected.

FROM REPORTS that reach us from Central Ohio it would appear that the building prospects for the coming season are quite flattering. One of the most important improvements now being made in that section of the country is the erection of the United States Government Building at Columbus, Ohio, Mr. J. T. Harris, of that place, being the supervising architect. A very fine court house, that is estimated to cost $100,000 when completed, is shortly to be erected at Marion, Ohio, from plans prepared by Mr. G. W. Giffs, of Toledo.

THE PEOPLE of St. Louis have apparently determined no longer to be behind Louisville and Cincinnati in the matter of a permanent exposition building and music hall. A very favorable site has been secured and a fund of $550,000 subscribed for the building, of which a considerable portion has been paid in. For a few days after the payments were first called for the money came in so fast that receipts could not be given. An energetic committee have the matter in charge, and they expect to invite competitive designs from the best architects in the country.

MESSRS. HASKELL & WOOD are the architects of a large business block that is being erected on the corner of Fifth and Quincy streets, Topeka, Kan. The building is 150 x 50 feet, three stories and basement. The front, which is on Fifth street, is of brick, with Warrensburg sandstone trimmings and columns of Connecticut brown stone. The first floor will contain 12 large store and office rooms, and the remaining floors 36 office rooms, with fire-proof vaults. The contractors are Messrs. Smith & Sargent, of Topeka. The owners are Messrs. Gavit & Scott. The cost is estimated at $65,000.

WORK ON THE Government post office and court-house building, situated on the corner of Kansas avenue and Fifth street, Topeka, Kan., is making good progress, and it is hoped that it will be completed early the coming year. The structure is 150 x 75 feet in plan and three stories, with basement, in hight. Crowley County stone, brick and iron are being employed in its erection, and it is considered fireproof in every respect. The building is surmounted by a tower 100 feet in hight, that will contain a clock, 8½ feet in the clear, lighted by electricity. Messrs. Smith & Sargent, of Topeka, are the contractors for the cut-stone work, Tweedsdale & Co. for the brickwork and the Missouri Valley Iron Works for the roof. The amount of money now appropriated for the building is $250,000.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=MAY, 1883. NUMBER 5

### A King's New Palace.

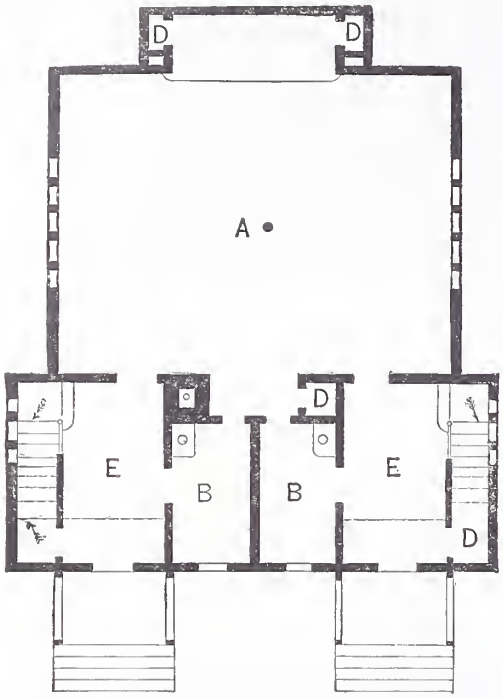
The new country seat of King Louis II, of Bavaria, is the most magnificent of his numerous castles, and in point of size may be ranked with the most celebrated palaces on the Continent. It is called Neuschwanenstein (New Swan's Stone), and stands on the isolated Tegelrock, opposite to the well-known Hohenschwangau, and two drawbridges connect it with the carriage-roads on either side. The castle has a hight of six stories, with rich decorative architecture in pure Italian style, and numerous balconies and corner turrets, all in solid granite. In the middle a great watch-tower rises to 360 feet in hight, with two verandas near the top, from which a grand view of the Bavarian Highlands may be enjoyed. The roof of the palace is covered with copper, crossed diagonally by gilded plates. An enormous court leads to the majestic portal, which is a marvel of the stone-cutter's art. The front of the right wing of the castle is decorated with two fresco paintings, 40 feet high, one of which represents St. George fighting the dragon, and the other the Virgin Mary with the Child, as the protectress of Bavaria. The pediment of this wing bears a bronze herald in ancient armor, holding the Bavarian standard, while the left side is protected by a bronze Bavarian lion. The interior of this royal residence is highly decorated by innumerable statues and double columns in the style of a Genoese palace, and the splendor of the State rooms can hardly be described. The ceilings are overloaded with decorative stucco-work, while the walls are embellished with fresco paintings by the first Munich artists. The subjects of these paintings are taken from the history of the Bavarian Kings from 1806 to 1867, from episodes of the Franco-German war of 1870–71, in which Bavarian troops took part, and also from the last music dramas of Richard Wagner, the "Ring of the Nibelung" and "Parsifal." The floors of the halls are either of mosaic work or of various woods in harmonious patterns. The King's apartments are on the sixth story, which, besides his study, private library and bed-chamber, only include an audience chamber for receiving the Ministerial reports. The royal study is decorated with the marble busts of the King's parent, of Richard Wagner, General von der Tann, Herr von Lutz and Augustus Heigl, the royal private secretary, besides a painting representing a scene from Wagner's "Rhinegold." It was in this chamber that King Louis received the news of the sudden death of his friend Wagner. The fourth and fifth stories contain the large halls destined for the extensive library and the collections of arms and coins. The ground floor includes a grand staircase with gold decorations.

### Design for a Schoolhouse.

Our first-page illustration this month presents a schoolhouse designed by Mr. Franklin J. Sawtelle, architect, of No. 5 Custom House street, Providence, R. I. The building shown was erected during the latter part of last year in the town of East Providence, R. I. The underpinning was of brick, the frame spruce. The floors were laid double. the top course being matched and of hard pine. The outside walls were clapboarded and the gables shingled in the general manner shown by the engraving. We are informed by the architect that the entire cost, including a furnace and the plumbing, was, in round numbers, $4200. The cellar was finished 7 feet 4 inches in the clear, with a depth of 9 feet at the furnace pit in order to gain a good pitch for the hot-air pipes. The smoke-pipe of the furnace was made to enter an 8-inch cast-iron pipe, which was continued

DESIGN FOR SCHOOLHOUSE, BY FRANKLIN J. SAWTELLE, PROVIDENCE, R. I.

up the entire hight of chimney. The chimney flue was 560 inches in area, large enough to constitute a good ventilating flue. The air in this shaft being rarified by the heated smoke-pipe, causes a strong upward draft. Ventilating registers were connected with this flue at the floor and ceiling of each room and recitation room, all as shown on the floor plans presented herewith. The plumbing employed in the building consists of a wash-stand in each cloak-room, provided with a marble slab and back, and one faucet for cold water. The waste runs to a cesspool, as indicated on the foundation plan. Contrary to our usual custom, in this case we have omitted the elevations in presenting the building. The general design is so clearly shown by the perspective sketch, supplemented by the details, which will be found on the succeeding pages, that it leaves little to be desired by those who would inspect a design of this character, either critically or for the purpose of employing the whole of it or some of its leading features. The scale is given with each of the details, together with a brief caption indicating the parts represented.




*Design for a Schoolhouse.—Fig. 2.—First Floor Plan. Scale 1-16th Inch to the Foot.*

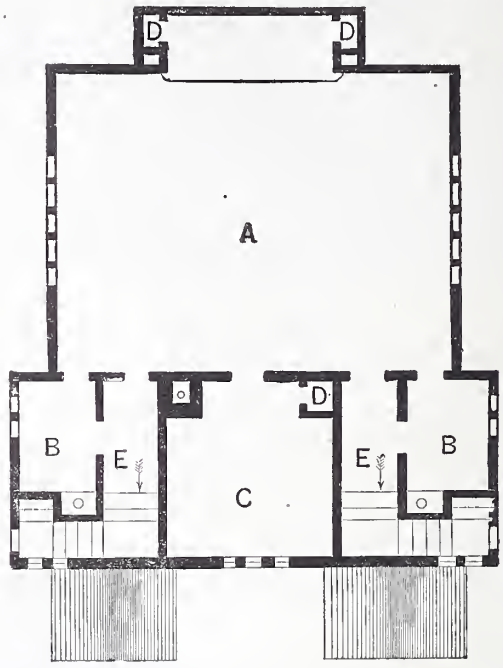
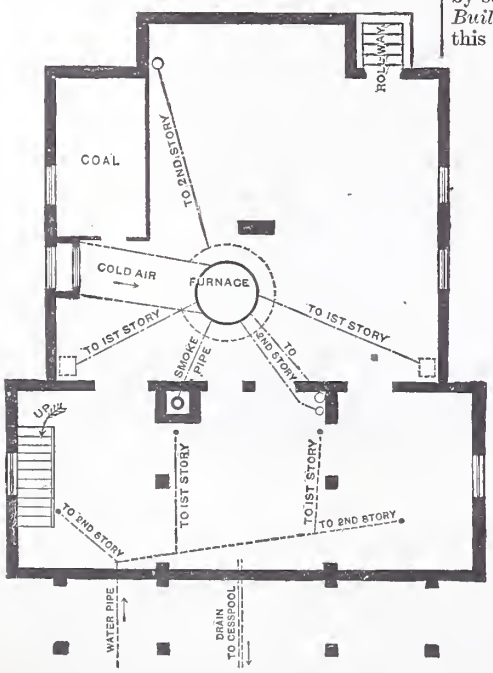



*Fig. 3.—Second Floor Plan.—Scale 1-16th Inch to the Foot.*

## Compressive Strength of Brickwork.

The subsidence and failure of lofty chimneys erected for manufacturing purposes might profitably suggest the importance of collecting data relating to the greatest direct pressure which shafts of masonry and brickwork can actually sustain with safety. The effect of the wind is a point which should not be overlooked in the construction of chimneys, although undue pressure is also caused by settlement, expansion by heat, &c. The *Building News*, of London, in considering this subject, gives some interesting figures relating to high chimneys in different manufacturing centers, and to the pressures exerted by them. Thus, for example, it mentions a chimney at Edinburgh, 341 feet high, and resting on a hard clay shale. It is 40 feet square at its base, and, according to one authority, exerts a pressure amounting to 2½ tons per square foot. The brick shaft above the stone pedestal exercises a pressure at the base of 8 tons per square foot, while the strength of ordinary brick has been estimated at from 20 to 30 tons per square foot. As a further instance our contemporary cites a chimney at Birmingham which is 312 feet high, the pressure on the base being 6 tons per square foot, and on the foundation below the footings, 1½ tons per square foot. Another chimney, 145 feet high, exerts at the base a pressure of 8½ tons per square foot of the hexagonal base. A glass-house cone, 75 feet high, had 4 tons per foot on the piers between the arches, which is thought as much as should be allowed where the brickwork is exposed to great heat. The great chimney of St. Rollox, near Glasgow, is 455 feet high, and is 41 feet diameter at the base, diminishing to 13 feet at the summit. So long as the pressure is not greater than one-twelfth of the ultimate resistance of the material, there need be little anxiety felt; but accidental causes, such as wind, leaning from a yielding foundation and settlement may bring the pressure on some portion of the beds to within a limit at which the structure would not be safe. Inferior bricks are often




*Design for a Schoolhouse.—Fig. 4.—Foundation Plan.—Scale, 1-16th Inch to the Foot.*

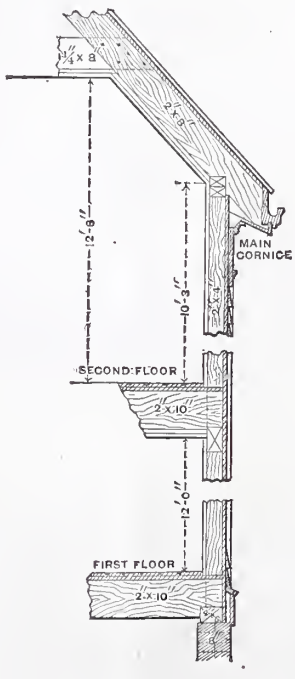



*Fig. 5.—Section Showing Story Hights, Cornice and Gutter.—Scale, ¼ Inch to the Foot.*

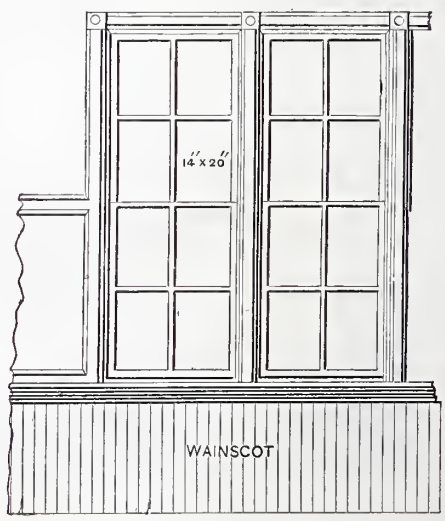
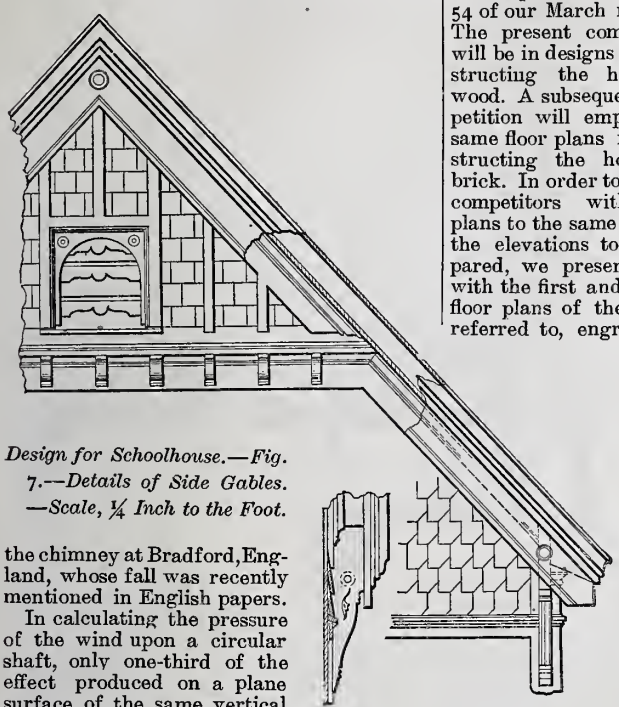



*Fig. 6.—Interior Elevation of Window, Showing Wainscot.—Scale, ¼ Inch to the Foot.*

used in construction of this kind, and when these are used in the foundations or base, the margin of safety becomes considerably diminished. In the oversetting tendency of wind on a high pile of brickwork, the pressure is suddenly shifted to one side, the leeward, and if the resultant approaches the outer face of the work, the pressure may be so increased as to cause a bulging or crushing at the joints, such as was observed in



*Design for Schoolhouse.—Fig. 7.—Details of Side Gables. —Scale, ¼ Inch to the Foot.*

the chimney at Bradford, England, whose fall was recently mentioned in English papers.

In calculating the pressure of the wind upon a circular shaft, only one-third of the effect produced on a plane surface of the same vertical section must be taken, and this force is found to act at a center of pressure taken at half the hight of the shaft. Of course, against this movement or overturning force there is the weight of the brickwork, multiplied into the radius of the base. The smaller the diameter of the shaft, the greater is the pressure sustained on a certain unit or square foot of the base, and the greater is the rocking tendency; also the less active power is there to counterbalance the pressure of external forces like wind.

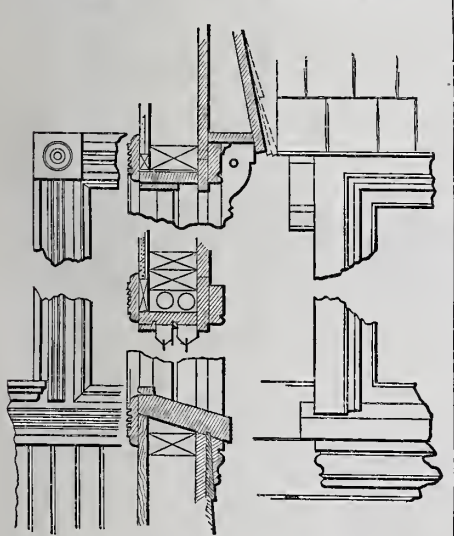


*Fig. 8.—Exterior and Interior Details of Windows.—Scale, ¾ Inch to the Foot.*

To load, therefore, a small base, the builder ought to use the utmost care in selecting the truest and hardest bricks, in equally distributing the pressure, and in providing against lateral forces like the thrust of an arch, which can only produce an uneven compression and tend to produce failure. These observations extend to all brick and masonry structures which rest on small areas, such as towers, columns, piers, chimney shafts and lofty walls. Of course, by widely spreading the footings, the pressure can be diminished generally to within very safe limits.

## The Eleventh Competition.

The next competition to which we invite the attention of our readers is the elevations and details of the cheap seven-room house to the plans prepared by Mr. A. H. Beers, Bridgeport, Conn. (No. 92), as announced in our last issue and as published on page 54 of our March number. The present competition will be in designs for constructing the house of wood. A subsequent competition will employ the same floor plans for constructing the house of brick. In order to provide competitors with floor plans to the same scale as the elevations to be prepared, we present herewith the first and second floor plans of the design referred to, engraved to the scale of ⅛ inch to the foot.

SPECIFICATION.

While in this contest there will be no specified limit of cost, we would remind all competitors that this is intended to be a cheap seven-room house. It is not intended that an attic story shall be provided, although there is no objection to the utilization of such space as may be formed by any judicious framing of the roof. Anything like an attempt to introduce a full attic story, by which additional expense is incurred, in order to provide more floor space than originally contemplated in the scheme of this contest, will be considered outside of this

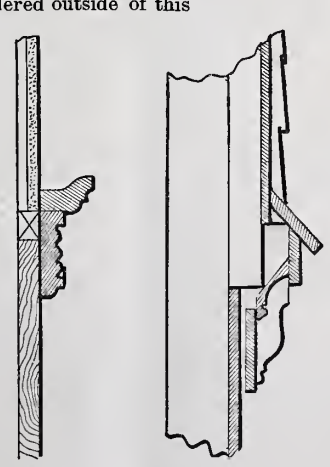



*Fig. 9.—A, Section Through Chalk Shelf; Scale, 1½ Inches to the Foot; B, Section Through Belt Course Across Side Gable, Scale ¾ Inch to the Foot.*

contest, and such features in a set of drawings will necessarily reject them. The house should be designed in a manner to adapt it to the wants of people of quite moderate circumstances. While in all its features it should be neat and tasteful, no useless expenditure

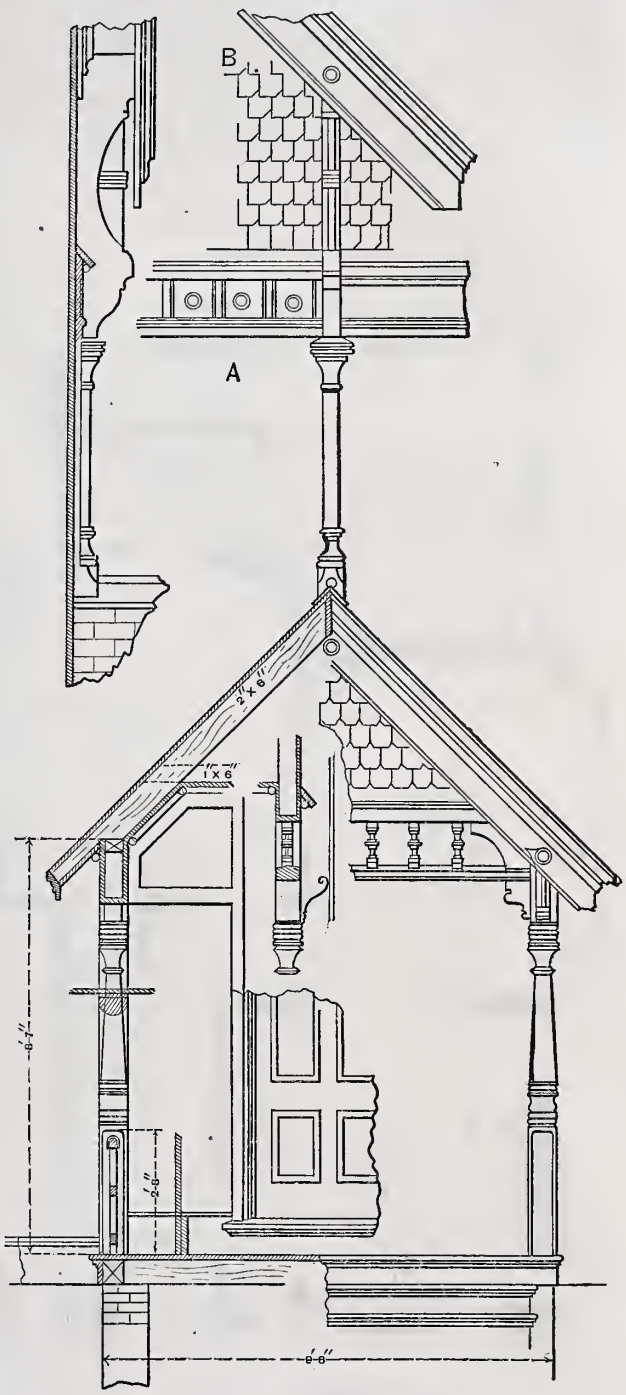



*Fig. 10.—Details of Entrance, Porch and Front Gable.—Scale, ¼ Inch to the Foot.*

of money should be caused by ornamental features. The style of architecture is left entirely to the discretion of the competitors. The contest will be one of design, appropriateness for the place, and suitableness for execution by builders of average intelligence and experience.

Some confusion in the original announcement of the competition in floor plans led to misunderstandings among contestants as to the location of this house with reference to the streets. In order to give competitors in the present contest a definite scheme on which to work, it may be understood that the house in question faces east. A side street may be considered as running down the south side of the lot. The extreme width of lot is 33⅓ feet. It is desired in this competition that all the efforts submitted shall show a house adapted for a corner lot as above described, and yet one that might be built on an inside lot in case it should be desirable to do so.

REQUIREMENTS.

Each competitor will be required to submit a front and a side (south) elevation, and also

a roof plan, all to the scale of ⅛ inch to the foot. A perspective view of the building as it would appear from a point located southeast from it is extremely desirable, but is not made one of the essential conditions of this contest. Details of the interior and exterior finish are required at the discretion of the competitors, drawn to a scale of ¾, 1½ or 3 inches to the foot, according to the nature of the parts represented. It is desired to obtain such details as will make the set of drawings complete for execution by builders of average experience. The drawings may be in pencil, but ink is to be preferred. In whatever way they are prepared, they must be clear and distinct in all particulars. Each set of drawings is to be accompanied by a brief description recounting the specia lmerits of the design shown. This description is for use by the committee which will decide between contestants. Each design, and the description just mentioned, must be signed by a fictitious name or device. The same name or device is to be put upon a sealed envelope which will contain the real name and address of the competitor. This envelope is to be inclosed with the drawings.

TIME.

The drawings in this competition may be sent by mail or express (charges prepaid), and must reach this office not later than June 30, 1883. They are to be addressed to David Williams, publisher *Carpentry and Building*, 83 Reade street, New York City.

PRIZES.

The prizes in this competition, as already announced, will be as follows: First prize, $50; second prize, $30; third prize, $20.

DECISION.

All the designs received up to the date of closing the contest will be put into the hands of a competent committee for examination. The decision will be announced in as early a number as the completion of the committee's work makes possible.

The almost universal demand for small houses—convenient, comfortable, inexpensive and yet tasteful—lends great interest to this contest. It is hoped that designers generally will give this problem consideration, not only in view of the prizes offered, but also on account of the manifest utility of the work involved. The subject is one which appeals to designers in a marked manner. In this case, as in a former competition, contestants and our readers generally will have the opportunity of examining different efforts and of comparing different modes of treatment of one common floor plan. There is thus afforded a base of intelligent comparison not ordinarily seen in architectural contests.

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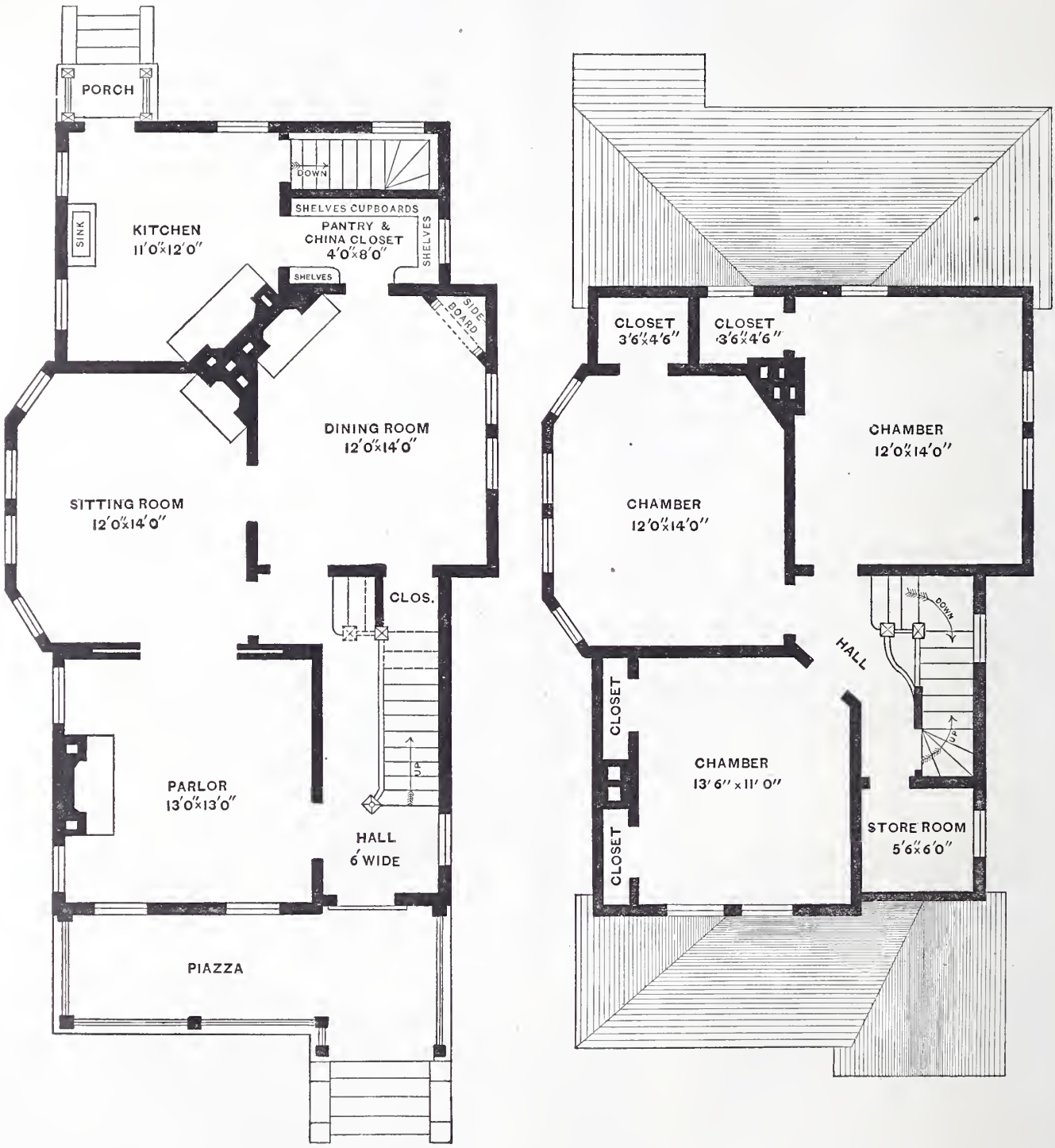
The building outlook for the coming season in the National Capital is considered, by those who certainly ought to know, as very favorable. Outdoor work has begun early, and is being pushed forward as rapidly as the weather will permit. In many cases parties are only waiting for assured good weather to break ground for building, and the structures now in progress of erection are being completed as rapidly as possible. Most of the prominent contractors already have plans and specifications in hand for estimates. A considerable portion of the improvements under way and in contemplation are private residences and apartment houses rather than business blocks. Favorable reports are also at hand from other sections of the country.



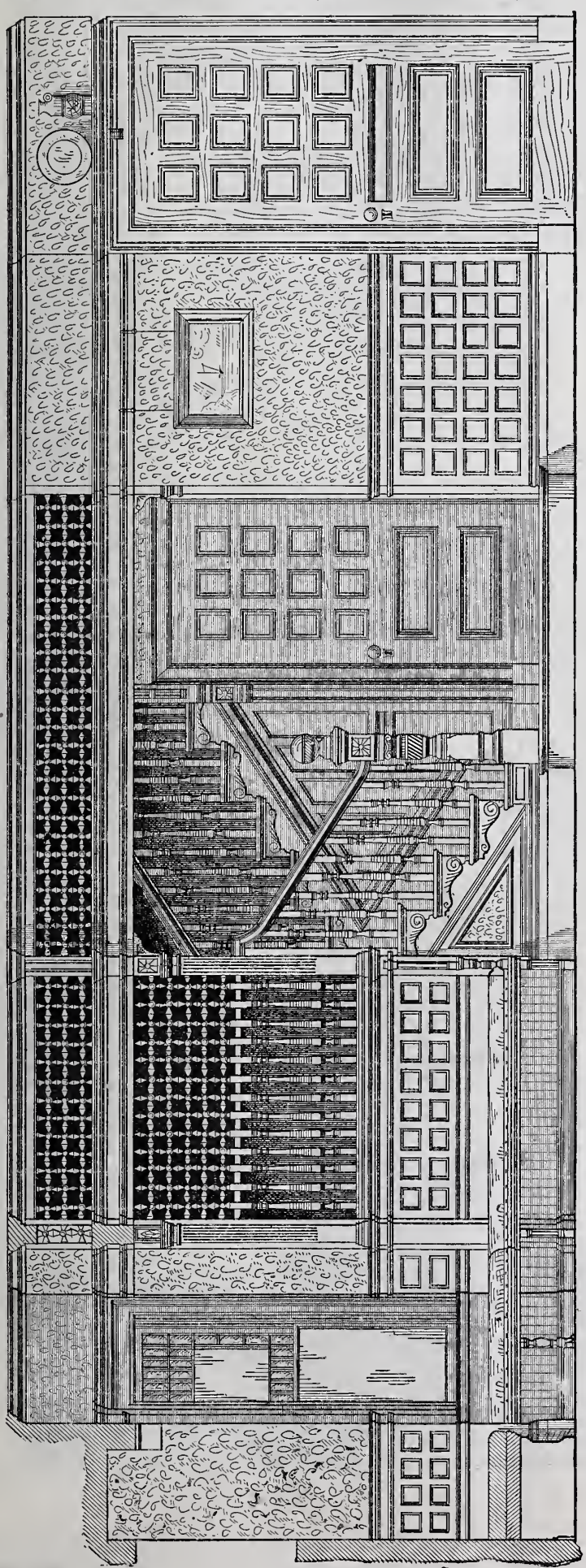

*The Eleventh Competition.—Floor Plans to which Elevations are Required.—Scale, ⅛ Inch to the Foot.*

## A Study in Suburban Architecture.*

BY AN ARCHITECT.

### The Hall.

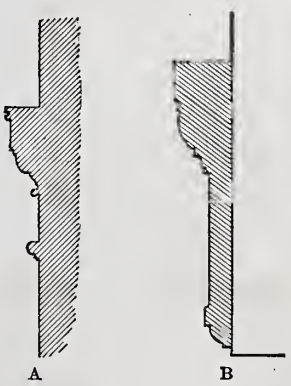
We are now getting pretty well along with the exterior of our house, and must begin to think of the details of our interior. Designs must be made for the several rooms, and their general character, at least, decided upon before we can make the walls ready for lathing. The hall first claims our attention. This room, as will be seen by reference to the floor plans, is not a mere passage, a tunnel or a bowling alley, but a full-grown, well-proportioned room, with a liberal fireplace at the end, and floor surface enough to accommodate a center-table if required, and plenty of easy chairs. It will be our reception-room, and sometimes a sitting-room, and at all times, we hope, a pleasant, comfortable abiding place, instead of the ordinary barren and cheerless corridor. In planning our hall, one of the first considerations was that the stairs should not encroach upon the size of the room to any extent either at floor or ceiling. It is very annoying to the architectural eye to find, on entering the hall, that one-quarter of the ceiling has been cut away—sometimes bitten into, as a boy would bite into a quarter of pie—that the stair may twist its way up to the second floor, and the corner thus made left hanging in mid-air without visible means of support. The stairs have a right to be fully in sight, and to add their richness of design, or their constructive features, to the appearance and decoration of the hall. But, we believe, they should be placed in a recess or a corner, and firmly occupy their own ground.



A STUDY IN SUBURBAN ARCHITECTURE.—ELEVATION OF NORTH SIDE OF HALL.

*Scale, ⅜ Inch to the Foot.*

The better to illustrate our ideas, a perspective view has been made, looking from the dining-room doorway toward the entrance. As we sit looking at our picture, we imagine it in all its future coloring, as it will appear as we pass from the dining-room after dinner. The general finish of the room is of quartered oak stained a rich reddish brown. The drapery a dull red, with lines of black, yellow—olive and old gold. The seats upholstered with russet leather studded with brass-headed nails. The wall surface between the wainscot and the frieze covered with a

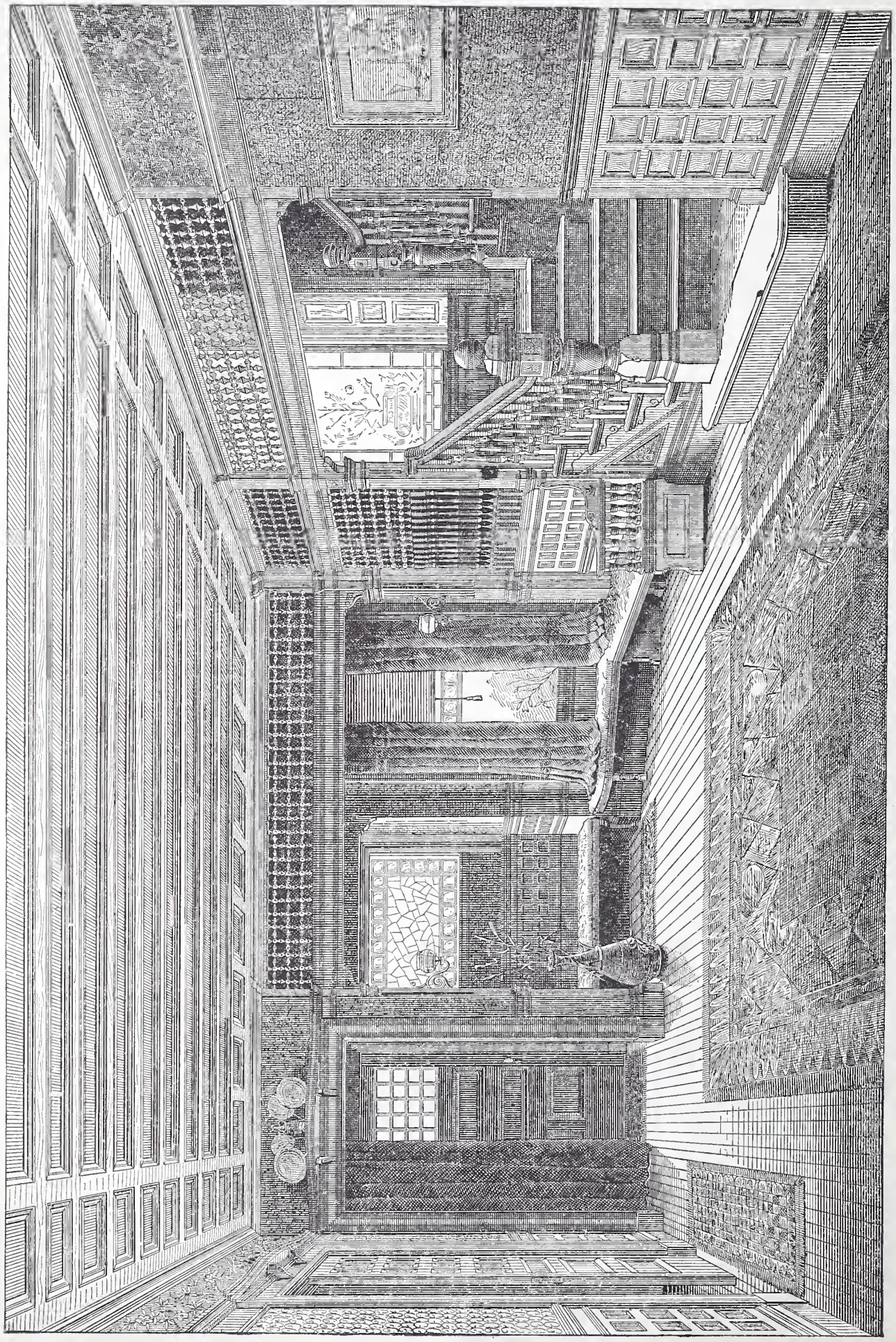



*A, Wainscoting Cap; B, Architrave.—Scale, 1½ Inches to the Foot.*

rich paper-hanging or leather paper, consisting of a rich scroll of golden tinge thickly interlaced above a dull peacock-blue ground. The frieze a reddish metallic color, with stamped pattern of leaves and flowers, in slightly varying metallic hues. The band at the bottom of frieze forms a picture molding. The same depth of ornamentation occupied by the frieze is carried over the stair opening and the entrance to alcove by a simple pattern of fine spindle work, and the platform of the stairs is partially screened in a like manner, extending to the landing, with delicate turned balusters. The floor is of narrow matched oak, polished. The ceiling is also of oak, stained slightly, with the intention of getting more of a yellow effect than is given by the side walls. In the rugs that lie about the floor dull reds will predominate, interspersed with low tones of yellow and green-olive, black and peacock-blue. The room will be lighted by a massive hall lantern of quaint design, made of wrought iron, a design of which will be given in connection with the other gas-fixtures at a future time.

Archie III, from Boston, raises a point, with reference to what he terms "inexplicable features" of the drawings illustrating these papers, that surprises us. Had he signed himself a draftsman we should have understood that he was a stickler for nice points, and would care more that every point and projection should appear in the elevation under consideration, even though its position on the plan were ever so remote, than he would for the quality of his design. This is not an important criticism, or one worthy of an architect, especially of Boston.

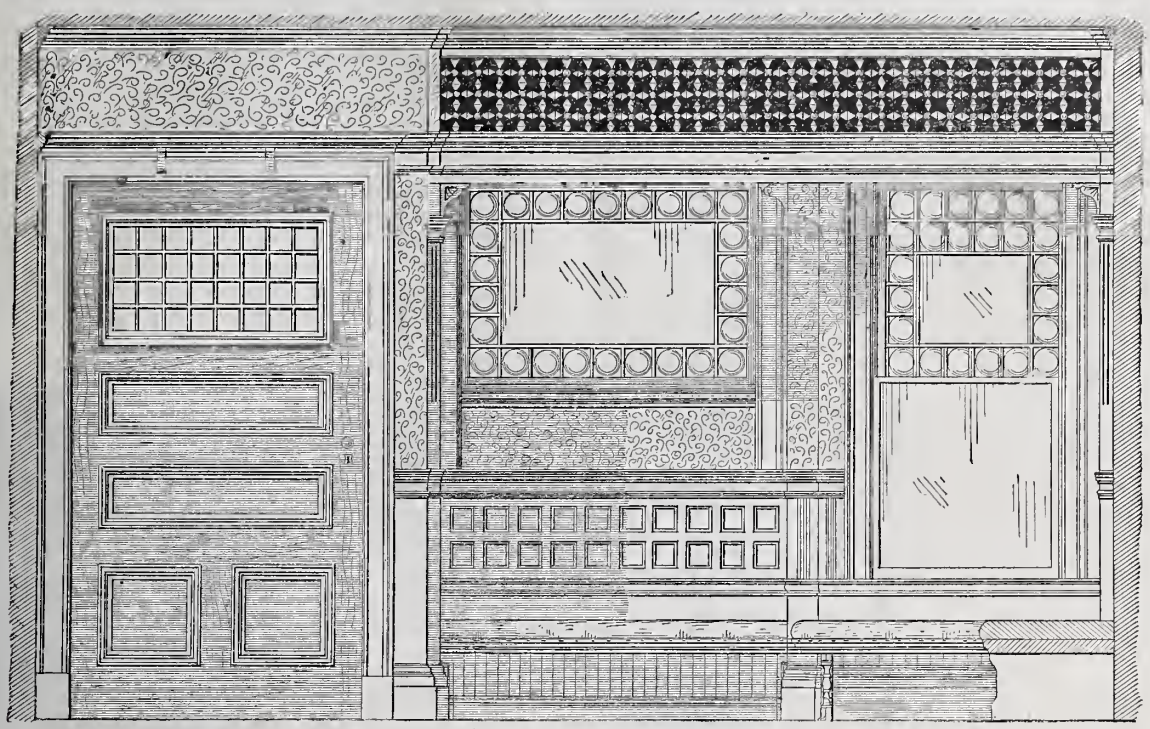
* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.



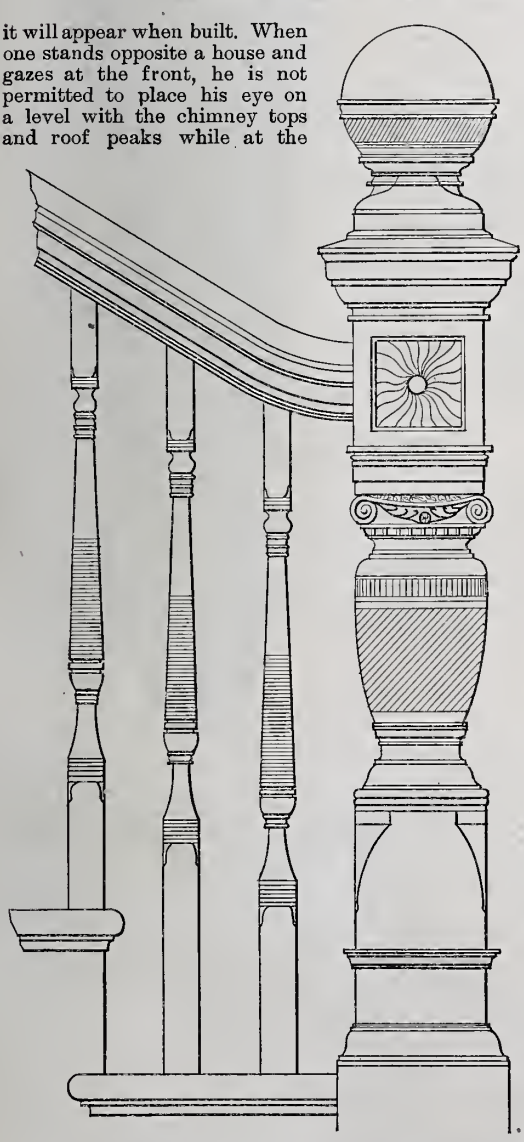
A STUDY IN SUBURBAN ARCHITECTURE.—VIEW OF HALL LOOKING TOWARD THE FRONT.

Every architect who has built houses knows that an elevation taken with every point showing that could appear in elevation, still is not a truthful picture of the house as it will appear when built. When one stands opposite a house and gazes at the front, he is not permitted to place his eye on a level with the chimney tops and roof peaks while at the same time his feet are upon the ground, and therefore he cannot see a great many projections that lie beyond and are a part of another elevation. An elevation is really a working drawing, and we feel sure that most carpenters who had a contract to build such a house would much rather that things belonging to one elevation would not appear on another to the confusion of the whole. Should we carry out the principle of showing everything that could possibly be seen in the front elevation, it would become quite absurd. For instance, we might look directly across the library, through its opposite windows, across the veranda, and behold the French casement leading from the sitting-room to veranda. Or we might look in at the hall window, and if the dining-room door should be considered open, look across that room also and out of the dining-room window, and take in all the landscape beyond. These things would confuse an elevation and spoil it for the purpose for which it is made. It is, therefore, a weak point in Archie III to say that the chimney and gable of projection to the sitting-room are troublesome members. He must know, if he understands perspective, that they would not trouble the ultimate appearance of the house when built, and that, although they might have been shown in the front elevation, it is just as well for the final result to leave them off.

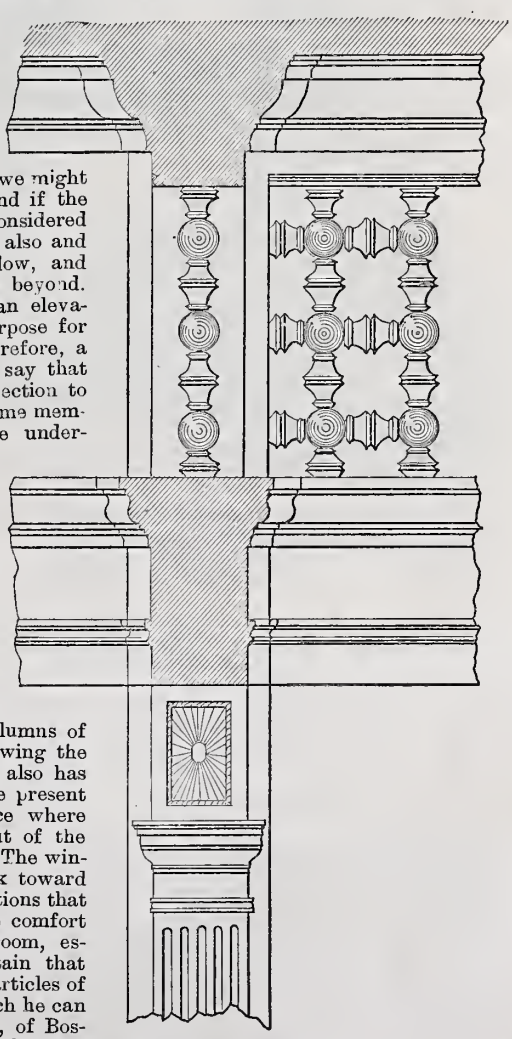
We do not think the corner at all damaging in its effect, and would like that Archie III should offer a perspective sketch to the columns of *Carpentry and Building*, showing the damage. We see that he also has not yet been converted to the present style of placing the fireplace where one can sit by it and look out of the window at the same time. The window seats are, of course, back toward the window, and are suggestions that do not materially affect the comfort of the occupants of the room, especially when one feels certain that these are not to be the only articles of furniture in the room on which he can sit. We imagine that Archie, of Boston, would like to sit by the fire and put his feet on these same window seats, and might find them also quite useful as wood boxes—we mean the window seats now.



*A Study in Suburban Architecture.—Elevation of Front End of Hall.—Scale, ⅜ Inch to the Foot.*



*The Newel, Balusters and Rail.—Scale, 1½ Inches to the Foot.*



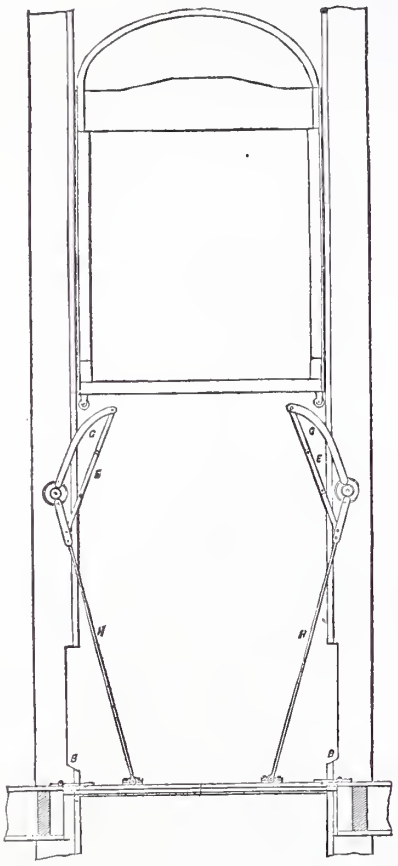
*Details of Screen.—Scale, 1½ Inches to the Foot.*

A committee to plan an industrial school at Springfield, Mass., have decided to teach the rudiments of trades, and not to turn out finished mechanics. The desire is to give the boy a knowledge that will enable him to choose a pursuit for which he recognizes his own adaptability, so that three or four years of his life may not be wasted after he leaves school in trying to determine how he will earn his living, and finally drifting through ignorance and necessity into work where manual labor, not brains, is needed. Industrial education is attracting marked attention at the present time, and the example of Springfield might well be emulated.

## NOVELTIES.

### Improvement in Elevators.

Those of our readers who have read our department of "Novelties" carefully in the past will recollect that at different times we have referred to a very perfect form of elevator, with automatic hatch doors, manufactured by Messrs. Clem & Morse, of 413 Cherry street, Philadelphia, Pa. In connection with what we have already published upon that subject, the following description of some improvements recently patented by this firm will be of special interest. The automatic portions of these elevators seem to be superior to almost anything else which has yet been produced, combining advan-



*Novelties.—Fig. 1.—Improvement in Elevators.—View of Elevator Car, Hatchway and Levers, with Doors Closed.*

tages of the most marked kind, while escaping many of the inconveniences of the ordinary forms:

The first of the improvements to be noticed is the improved automatic door-joint. It consists of so arranging the joint or hinge on which the door is hung and the brakes

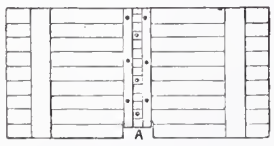


*Fig. 2.—The Hatchway Door.*

in the guide timber that the door, in rising, makes the guide continuous from top to bottom without break, and at the same time enables the door to close without leaving any opening at the back. The form of the door is shown in Fig. 2, where A is the recess cut for the guide. In Fig. 1, B B is the recess into which the door closes. The lower part is cut away, so that any dirt or obstruction may naturally roll out, and in doing so, if it falls upon the door itself, will, as the door rises, roll off and escape below without jamming. A door hung in the ordinary manner leaves a break of several inches in the guide-strip when it is raised into a vertical position, and the guide of the elevator car is very likely to be caught in this opening, and sometimes serious accidents occur in this way, a general smash-up usually resulting when this happens and even if catching does not take place there is generally a very unpleasant jar as the car passes the guide.

Referring to the drawing at C, in Fig. 3, it will be seen that the door opens and completes the guide-strip, so that there is no opening,

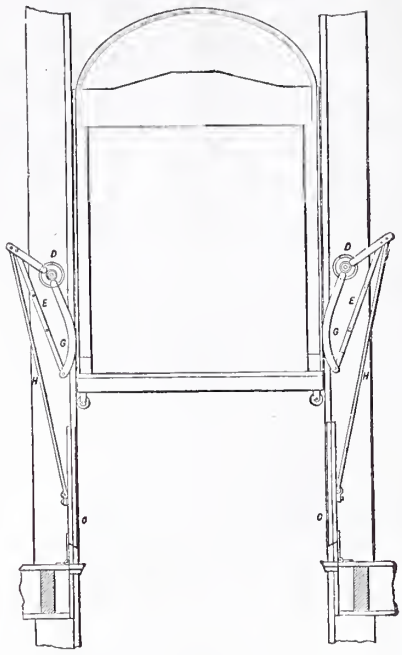


*Fig. 3.—View of Car, Hatchway and Levers, with Doors Open.*

the notch in the door enabling it to rise sufficiently to fit the opening exactly. The guide-strip extends several inches above the floor before it is cut out to receive the door, and, as it is cut on a bevel, and the guide on the under side of the door on a similar bevel,

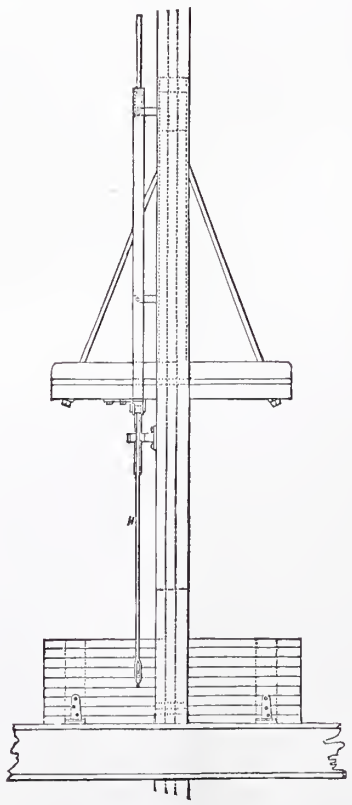


*Fig. 4.—Side View of Elevator Car, Hatchway and Levers.*

the joint which is formed is very perfect. This opening at the back of the door while it is rising prevents, as we have said, a bit of coal or other rubbish from keeping the door from going flatly back into its place. With the old style of doors, when this happens, the descending car is often caught and held up long enough to allow the cables to slacken and snarl up by uncoiling from the drum. The second improvement consists in making the lever D D, or bow by which the door is opened, in two parts, which are pivoted at the center. These are connected by two slotted rods, E E, which are clamped together by set-screws (see Figs. 1 and 3). By simply loosening these screws and lengthening or shortening the bar E, the angle of the bow G can be changed in reference to the connecting-rod H. This enables the force through which the door is held back in place to be perfectly regulated, and in case of a settling of the floors, shrinkage of the woodwork, or change in the relationship of the parts, the door can be quickly adjusted to keep its place perfectly while the car is passing up and down. Those who are familiar with the constant movement found in even

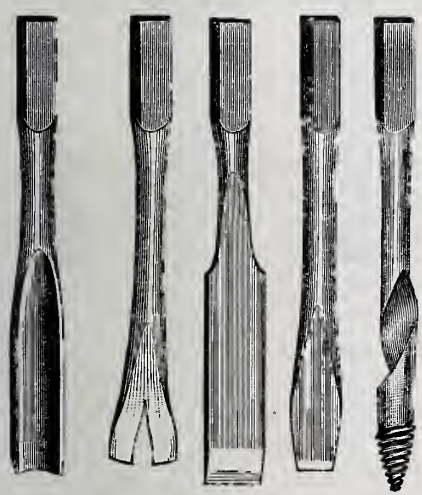
*Fig. 5.—The Giant Tool-Handle, Full Size.*

well-constructed warehouses, will at once see the advantage of a movable arm in this position, as it enables the doors to be kept in perfect adjustment without the necessity of taking off the door and rod and sending the bow to a blacksmith to have it drawn out or shortened, as is necessary with doors which do not have this improvement. Fig. 4 is a side view of the apparatus, showing the door partly raised by the cage or elevator platform. We have seen this apparatus in operation, and certainly for smoothness and perfection of working it seemed to leave nothing to be desired. It is applicable in a great variety of situations, and seems to do away with a multitude of objections which have heretofore been urged against automatic work for hatchway doors.

### Giant Tool-Handles.

Almost every carpenter and builder has in his chest a tool-handle, the special features of which are a hollow receptacle in the top

for containing a miniature set of tools, and a clutch of some kind at the opposite end in which they can, one at a time, be fixed. Tools of this general description are so common that they may be considered almost universal. We have described one or two varieties of this article in previous numbers of *Carpentry and Building*. The greatest objection that has been presented against tools of this sort in the past has been that the bits are generally too small to be really useful. The gouges, chisels, screw-drivers, and so on, of which the set is composed, are generally so diminutive as to be of very little service in practical work. Messrs. C. E. Jennings & Co., 96 Chambers st., New York City,



*Novelties.—Fig. 6.—Part of the Set of Tools Accompanying the Giant Tool-Holder, Full Size.*

have recently put upon the market a tool of this description which is calculated to meet the objections just referred to. A full-size illustration of the handle is given in Fig. 5 of our engravings, while half of the set of tools is also shown full size in Fig. 6. The handle contains 10 tools made of the best cast steel tempered in oil. The list is as follows: Screw-driver, gimlet, gouge, scratch-awl, chisel, tack-claw and four brad-awls of assorted sizes. From the full sizes shown in Fig. 6, it will be seen that these tools are large enough to be of practical use, and that, therefore, this tool-handle will be of actual service, as well as a curiosity or plaything. The handle is substantial in all particulars. The clutch by which the tools are held is clearly shown in the engraving. It is easily operated and is well adapted for the purpose for which it is intended. The top of the handle in which the tools are placed is closed by a metal cap, which is pivoted in connection with a spring. To open the lid the thumb-nail is required to raise it slightly, when it swings to one side, as shown in the engraving.

### Friction-Feed Cut-Off Saw.

An improved friction-feed cut-off saw, which is guaranteed by the manufacturers to cut up more lumber in a given time than can be cut by any saw that has a sliding table, and also to accomplish this with one-half the labor otherwise required, is manufactured by the L. Wright Machine Works, Nos. 10 and 12 Alling street, Newark, N. J. A view of the machine is shown in Fig. 7 of our illustrations. The device contains several new and valuable improvements. One of these, and which is considered the most valuable by the manufacturers, is the friction-feed for drawing the saw forward. Another important feature is the gauge and adjustable stop for cutting off pieces to uniform length. The main belt of this machine is put on endless, and is kept tight by a yielding tightener, which compensates for any stretch in the belt. In the engraving the table is shown raised, exhibiting part of the mechanism. There is also shown, at the left, the foot of the operator resting upon a treadle, by which the saw is drawn forward at a speed determined by the movement of the foot. This is accomplished, as already stated, by a friction-feed, and the speed at which it moves can be varied to suit circumstances. A strap runs from the treadle over a small pulley, on the same shaft as the large pulley, shown in the front of the machine. This pulley is always revolving when the saw is in motion. By pressing on the treadle the strap or band is drawn tightly over the pulley, thus causing sufficient friction to draw the saw forward. If a 4-inch plank, for example, is to be cut, the foot will be moved slowly, but, on the other hand, if an inch board is to be cut, the foot will be moved with a greater speed. It is variable in this manner to suit the work being done. When the cut is made the foot is raised and the saw immediately moves back ready for another cut. The saw is drawn back by the weight shown at the right of engraving. Though the saw moves back with great rapidity there is no slack or jar in the stopping, as an air-cushion peculiar in its construction to this machine is provided to receive the blow. From this description it will be seen that in using this saw the operator has nothing to do with his hands except to manipulate the lumber. The labor of drawing the saw forward or sliding the table is saved, the operation being accomplished by the same power that drives the machine. Another feature to which the manufacturers direct attention is the manner of guiding the saw-carriage. The ways in which this runs are so adjustable as to compensate for all wear. The saw-carriage has attached to it, and projecting backward, a tongue, which passes between adjustable rollers attached to the back end of frame, which acts as a guide. This arrangement avoids twisting or cramping of the saw or carriage, and obtains the greatest ease of movement and accuracy of cut. An improved gauge and measuring attachment embodied in this machine consists of a plate of iron, 2¾ inches wide by ¼ inch thick and 9 feet long, secured on top of a strip of hardwood of the same length. This is used as a gauge to place the lumber against, and is attached to the front end of the machine, as shown in the engraving. The iron plate is graduated to eighths of an inch. A 5-16ths-inch hole is drilled corresponding with every eighth mark on the scale, making 576 holes in all. On the top of this plate a sliding stop is placed, to which is attached a rod having at its other end a knob terminating in a pin on under side. In setting this gauge the pin is inserted in the hole on the scale indicating the exact length desired. As this can be done without the operator changing his position, no time is consumed in measuring, and there is insured exact uniformity in lengths. The manufacturers state that this has proved to be a very decided improvement over the ordinary way of measuring, and that it saves fully one-half the time commonly required. The graduated plate above referred to is figured with large plain figures at each inch-mark from 1 to 72. The parts of an inch are easily seen by the arrangement of the holes.

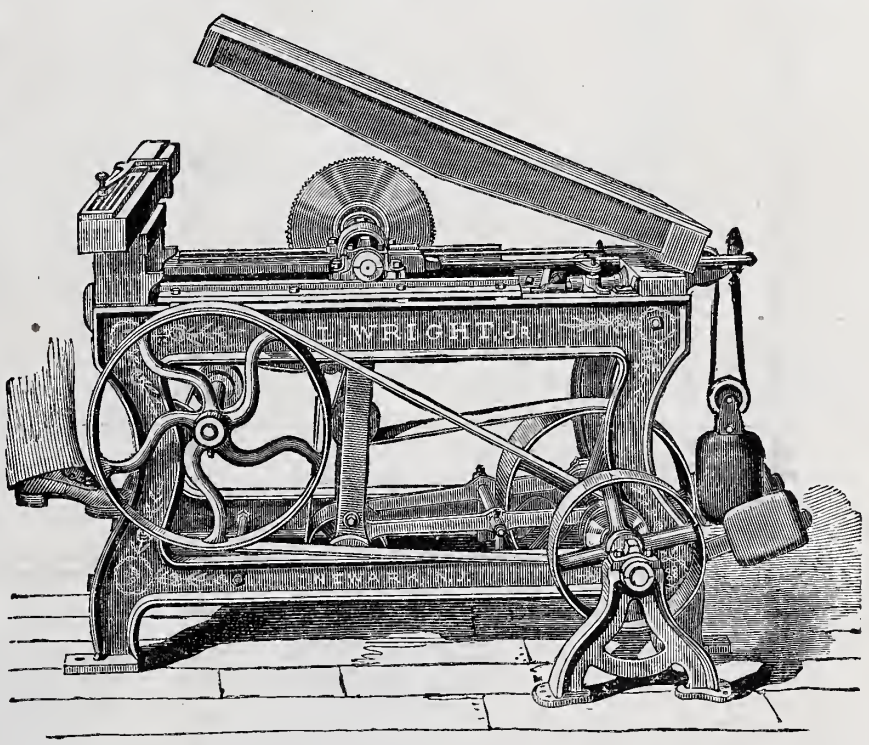



*Fig. 7.—Improved Friction-Feed Cut-off Saw.*

### Straw Lumber.

We had occasion a short time since to investigate pretty thoroughly the character, properties and uses for straw lumber, manufactured by the Hamilton Straw Lumber Co., Lawrence, Kan. This material is turned out in boards or sheets 33 inches in width by 12 feet in length, and of various thicknesses. It is heavier than black walnut, has no grain, is of the color of straw-board, though considerably darker, and is much stronger and stiffer than ordinary timber. Though made in considerable quantities at the present time, the supply seems hardly equal to the demand. There are advantages in this material which in the near future will probably make it of the highest value, not only for carpenters and architects, but for the car-builder, and, in fact, for mechanics generally. Its toughness, the firmness with which it holds nails and screws, the ease with which it can be cut, and the fact that it can be bent by the aid of heat, shaped in dies, and is not liable to shrink or warp, and is little affected by water, even when unprotected, makes the range of its probable uses extraordinarily great. It seems to be a non-conductor of heat and electricity. It can be rolled up into pipes of great strength and light weight, and is available for a range of uses for paneling purposes for which we have no equivalent.

It appears that there are no fewer than 15,024 saw mills in the United States, and 637 in Quebec, Ontario and Manitoba. The figures of the work performed by these mills are almost bewildering, and during last year nearly 750,000,000 feet more timber was manufactured than in the year 1881. Toward the close of the year new mills were being built in every direction, so as to be ready for work this spring—all of which promises to keep insurance companies as busy as ever paying losses on this class of special risks.

The Broderick & Bascomb Rope Co., of St. Louis, are building an addition to their works, 60 x 80, to accomodate their increasing trade.

## A One-Story Workshop.

The following valuable paper, by Mr. W. H. Dabney, Jr., though relating chiefly to the construction of machine shops, will be found to contain many valuable suggestions for architects and builders in general.

The advantages of one-story machine shops are beginning to attract a great deal of attention among those who have new shops to build or additions to make to old ones, and in locations where land is reasonably cheap there seems to be every inducement for adopting this form of construction. Light is abundant, and greater than can be obtained in any other style of construction. The cost of artificial illumination is proportionately reduced, and to such an extent as to form a material item in the running expenses. The actual cost of building, the advantages of having firm foundations for machinery, immunity against fire and a variety of other advantages are claimed for this style of construction, many of these having been thoroughly canvassed heretofore.

The Corliss Steam Engine Co. was perhaps the first to build a one-story shop of brick to the window-sill and frame from there up. Mr. Wm. H. H. Whiting, of Boston, adapted this method to cotton mills, but replaced the objectionable light frame by solid posts at intervals of 8 or 10 feet, the intervening space being entirely filled up with sash and window frame. The building given herewith is designed after Mr. Whiting's method of construction, but with some variations, particularly in the monitor.

A one-story building 100 feet square is adopted, for convenience, as an example, but as the light comes in great measure from the top, it may be widened, or lengthened, or both, to any extent, without changing the construction. The walls of the building are brick to a hight of about 2 feet 6 inches above the level of the floor. On this wall are laid heavy sills, bolted down at intervals, and into which the heavy posts are mortised. These posts carry a plate to receive the rafters. The space between the posts is completely filled up by the windows and window frames, leaving no concealed spaces where fire can lurk or spread. The roof is composed of heavy plank to keep out the heat of summer and the cold of winter, and also to oppose a solid resistance to a fire. While the roof remains there is always a chance of saving a building, but as soon as it burns through it may as well be given up. The monitors used are preferable to skylights on many accounts; they afford good ventilation and obviate the usual leaking and dripping of the latter. The corners of the building for a space of about 10 feet each way are built of brick to the roof plank, as shown on the elevation given. This building ought to cost about 85 cents a square foot of floor surface.

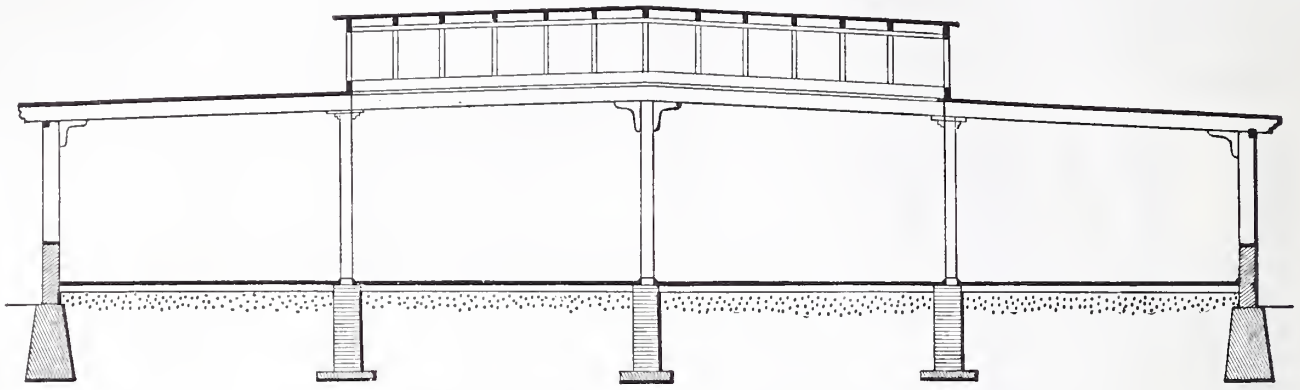


*Fig. 1.—Section.—Scale, 1-16th Inch to the Foot.*

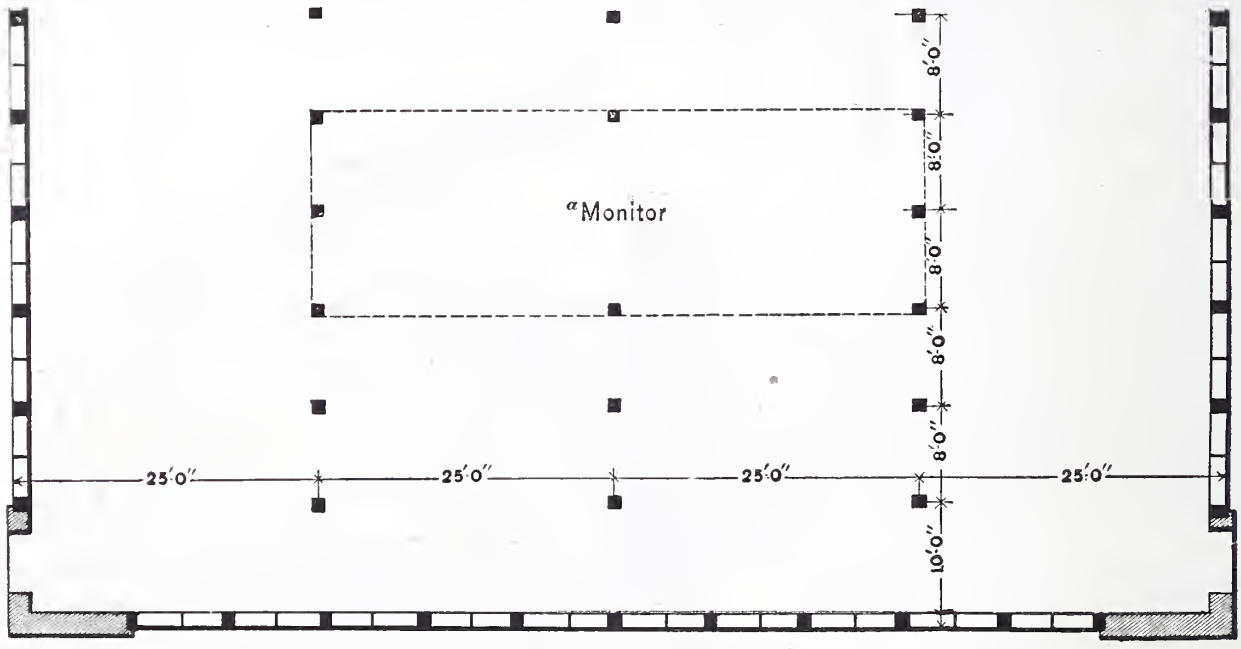



*Fig. 2.—Plan Showing Half of Shop.*

*Fig. 3.—Elevation.—Scale, 1-16th Inch to the Foot.*

A ONE-STORY WORKSHOP ONE HUNDRED FEET SQUARE.

SPECIFICATIONS.

*Foundation.*—Foundation walls to be built from hard-pan below frost, to be of good quality stone laid in good cement mortar, thoroughly flashed, pointed outside and in, to be 24 in. thick at top and to batter one in five.

*Piers.*—Piers to support columns to be 24

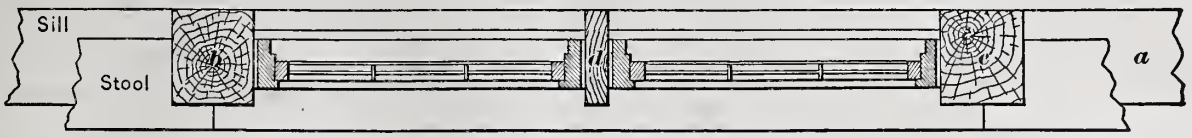



*Fig. 4.—Horizontal Section, Main Window.—Scale, ½ Inch to the Foot.*

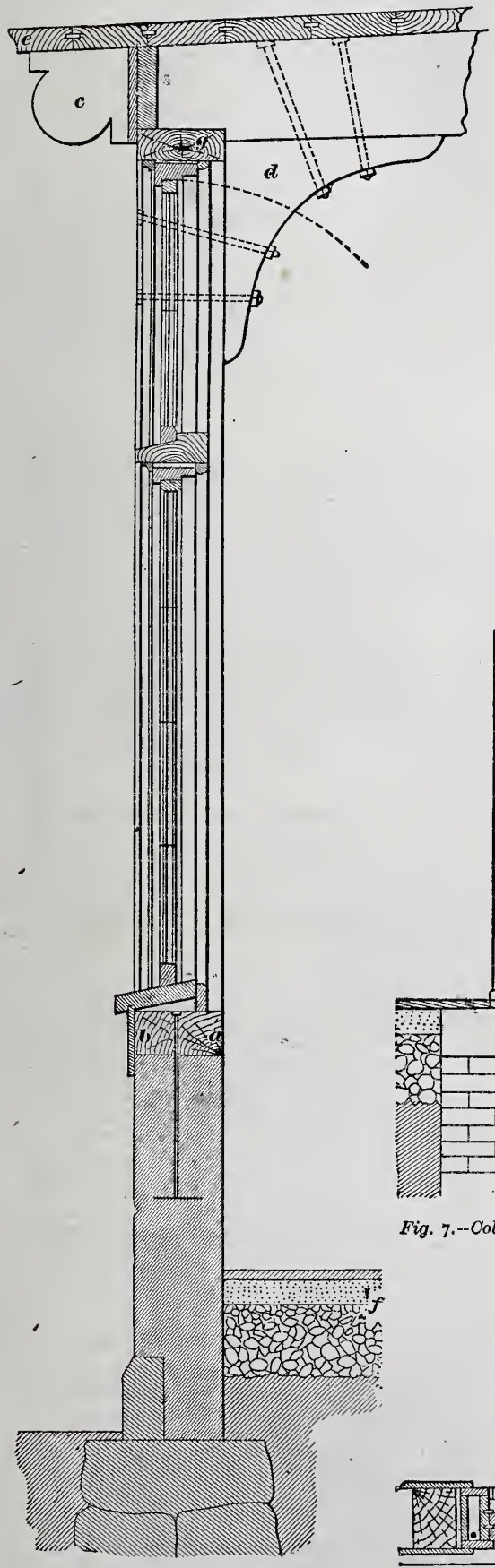



*Fig. 5.—Section Through Window.—Scale, ½ Inch to the Foot.*

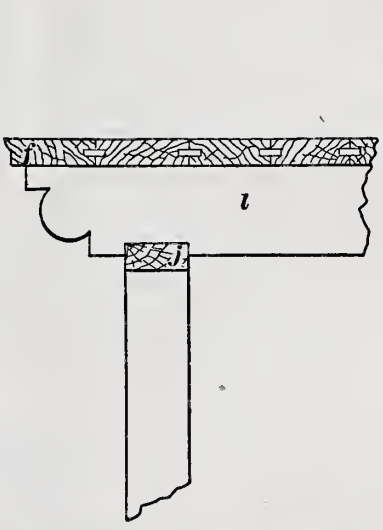



*Fig. 6.—Monitor Plate and Rafter.*

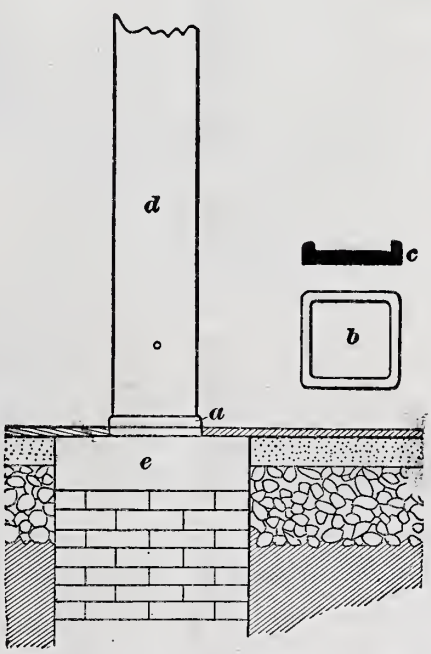



*Fig. 7.—Column and Foundation.—Scale, ½ Inch to the Foot.*

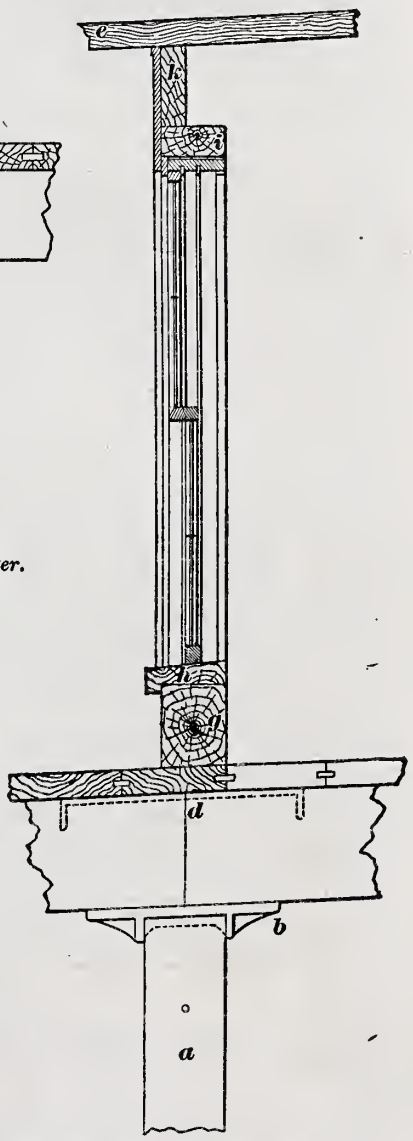



*Fig. 10.—Section of Monitor.—Scale, ½ Inch to the Foot.*




*Fig. 8.—Plan of Plate Capping Posts, Shown at b, Fig. 3.*

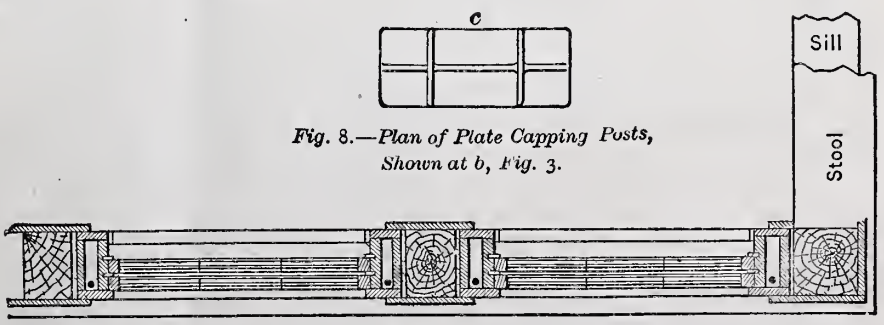



*Fig. 9.—Horizontal Section, Monitor Window.—Scale, ½ Inch to the Foot.*

DETAILS OF A ONE-STORY WORKSHOP.

in. square, of hard brick laid in cement, to be started upon good flat stones laid on hard-pan, and capped by North River flag-stones 6 in. thick. (See Fig. 7, *e*.) Top of stone to be level with top of concrete of floor.

*Brick Walls.*—To be of best quality hard brick, laid close-jointed, with a running bond; one course of headers on inside of wall every 4 ft., thoroughly flashed and pointed. No soft brick to be used.

*Mortar.*—To be of one part lime and two parts sharp sand.

*Sill.*—To be of Georgia pine, 12 x 6 in., spliced in convenient lengths and anchored to brick wall at every bay. (See Fig. 4, *a*, and Fig. 5, *a*.) To be cased on outside to protect joint with brickwork. (See Fig. 5, *b*.)

*Main Posts* —To be of Georgia pine, 12 x 10 in., set 8 feet apart on centers, tenoned into sill and tenoned at top to receive plate. (See Fig. 4, *b* and *c*.)

*Intermediate Posts.* — To be of Georgia pine, 3 x 12 in., tenoned in same way as main posts. (See Fig. 4, *d*.)

*Columns.*—To be of Georgia pine, 10 in. sq., bored from end to end at the center, 1½ in. hole, and cross-bored at top and bottom for ventilation. (Fig. 7, *d*, and Fig. 10, *a*.)

*Base-Plate.*—Cast iron base-plate, with socket for post, to project 1 in. above floor, to protect base of column from water. (See Fig. 7, elevation *a*, plan *b*, section *c*.)

*Cap.*—To be of cast iron, with flange let into top of post to hold it in place. (See Fig. 10, *b*, Fig. 8, *c*.)

*Main Plate.* — To be 4 x 12 in. Georgia pine. (See Fig. 5, *g*.)

*Rafters.*—To be of Georgia pine, 10 x 14 in., set over main posts, 8 ft. apart on centers, butt-jointed over columns and fastened with two ⅞-in. wrought-iron dogs, as shown at *d*, Fig. 10. Ends of rafters to project about 18 in., and be shaped into a bracket to support projection of roof-plank. (See Fig. 5, *c*; also Fig. 6.) Rafters to pitch 1 in 24.

*Knees.*—Good hackmatack knees to be used at side and middle posts, as shown on section of building, and at *d*, Fig. 5, 5 in. thick, 30 in. long on each leg, to be bolted to posts and rafters with four ¾-in. wrought-iron bolts, as shown.

*Roofing.*—Rafters to be covered with 3-in. soft-pine plank, grooved and splined, thoroughly spiked to rafters with 60-penny nails. (See Fig. 5, *e*; Fig. 10, *e*, and Fig. 6, *f*.) Under side planed and beaded. Plank to be covered with best quality tar and gravel, or asphaltum roofing. The flashing to be carried up over monitor sill *g*, Fig. 10, and under window-stool *h*, and nailed on the inside. Instead of tar and gravel, cotton duck and roofing felt may be used. Duck to be well painted and carried over monitor sill in same way as flashing.

*Monitor Sill.*—To be of Georgia pine, 8 x 10 in., spliced in convenient length, securely spiked to top of plank of main roof. (See Fig. 10, *g*.)

*Monitor Posts.*—To be of Georgia pine, 8 x 6 in., corner posts 8 x 8 in., set 4 feet apart on centers and tenoned into sill and tenoned at top for plate. (See Fig. 9.)

*Monitor Plate.*—To be of Georgia pine 8 x 4 in. (See Fig. 10, *i*, and Fig. 6, *j*.)

*Monitor Rafters.*—To be of Georgia pine 3 x 12 in., running across monitor at right angles to main rafters, and set 4 ft. apart on centers and locked over plate. (See Fig. 10, *k*, and Fig. 6, *l*.)

*Monitor Roof.*—To be the same as main roof.

*Main Windows.*—Frames to fill the whole space between posts and between sill and plate, as shown in vertical section in Fig. 5 and horizontal section in Fig. 4. Lower sash to be firmly screwed in; upper sash to open in on hinges, as shown by dotted arc, Fig. 5. Rabbeted inside for winter sash.

*Monitor Windows.*—Frames to be made with weight boxes, as shown in vertical section in Fig. 10, and horizontal section, Fig. 9; upper sash to be double hung, so as to be open for ventilation. Frame rabbeted inside for winter sash.

*Floor.*—To be of tar concrete laid on foundation of broken stones (see Figs. 5 and 7, *f*); 3 x 4 inch Georgia pine strips to be bedded in the concrete to receive top floor. Top floor to be of Georgia pine well seasoned, 1¼ inches thick and planed on upper side, to be well nailed to strips every 16 inches with tenpenny floor brads.

*Finish.*—Side posts, columns, sills and plates to be dressed on four sides, rafters on three sides.

*Painting, &c.*—All outside finish to receive two coats of paint made of best white lead and linseed oil, colored to suit. All pulley stiles and stops to receive one coat shellac and two coats linseed oil. No paint to be applied inside except to doors, door casings, window sash and casings.

The one-story workshop thus constructed has many obvious advantages over one of many stories. In the first place it costs much less to build it, and when built it costs less to run it, since the machinery placed on this solid foundation runs more evenly and with much less wear and tear. Moreover, as it is nearly as light inside as out of doors, the gas bills will be much smaller. It is a general belief that it is hard to heat a one-story building, but experience shows that this is not so where the roof is made of thick plank. On the contrary, the heat, the light and the ventilation are all under perfect control.

There is no room wasted in stairs, and the expense of lifting the stock in process of manufacture is done away with. There is a chance to divide the floor space in the most convenient manner for the different departments of the business without being hampered by the space being already divided up into floors. With the extra convenience in manufacturing, the cost of superintendence can often be reduced.

Should the owners wish to extend at any time, they have only to replace a side or end wall with a row of columns and continue the same construction indefinitely. From the open construction and the fact that the timbers are large and present few corners to the flame, a fire is not likely to catch, and if one does, the whole building is within easy reach of the firemen and their apparatus, and the operatives can escape without danger of loss of life.

## Result of the Ninth Competition.

According to the report of the Committee of Award to which was intrusted the decision in the Ninth Competition, the first prize has been paid to Mr. John R. Church, Rochester, N. Y.; the second prize to F. J. Grodavent, Syracuse, N. Y., and the third prize to Mr. T. F. Schneider, Washington, D. C. The efforts generally submitted in this competition were very fine, and the general average of the drawings was far above any of those which have heretofore been received in our competitions. Part or all of the prize designs above mentioned will be published in our columns as soon as space can be found for them and the engravings, which will necessarily be very elaborate, can be prepared. Accordingly, we will reserve for some future occasion any comments, so far as they are concerned, which it may be appropriate to make. The Committee of Award specially commend the efforts of the following contestants, and suggest that a fourth grade in this contest be established for their benefit—in other words, that their names be entered upon the roll of honor: J. F. Moore, Minneapolis, Minn.; M. B. Bean, Philadelphia, Pa.; B. C. Pond, Auburndale, Mass.; J. C. Worthington, West Philadelphia, Pa.; I. W. Kelley, Minneapolis, Minn.; Chas. E. Willoughby, Perth Amboy, N. J. Each of these designers has studied the subject very carefully, and has submitted a design which does him great credit. Did our space permit we should be pleased to enter into extended comments with respect to all of these drawings. We shall stop only, however, to notice the effort of Mr. Worthington, which in many respects commands attention. The house in its general appearance, the shape of its roof and absence of relief, is very plain, but colors have been freely used, and the designer says, in his letter of explanation, that he has depended more upon the massing of colors and the effect obtained in this manner than upon other features which might have been incorporated. He also lays special stress upon the simplicity of detail. The perspective sketch which accompanies this set of drawings unfortunately does not do the subject justice. An undue hight, with proportionate narrowing of the foundation lines, appears in this view, and gives a poor idea of what would really be shown were the house executed as the designer had in mind.

## Iron Shutters vs. Wood Incased in Tin.

Mr. Edward Atkinson, in a note on the subject of iron shutters for buildings, says:

Of all the materials in common use, and which are commonly depended upon for preventing destruction by fire, there is none so treacherous as unprotected iron, with the possible exception of granite. Iron doors and iron shutters may have occasionally appeared to prevent the passage of fire through a window or doorway, but such successes can only have been attained either by their not being subjected to great heat or else by their being drenched and kept cool with water. Whenever and wherever they have been exposed to severe heat, they have been so quickly warped and twisted as to have become practically useless as safeguards, while they have often prevented access to buildings, and have thus greatly increased the loss or damage from the fire raging within. There is nothing yet invented which can be said to be absolutely fire-proof by which window spaces or doorways can be protected; but the heavy wooden door or shutter incased in tin will retard the action of fire in sufficient measure to give the firemen a fair chance to put it out in the room in which it starts. If two thicknesses of inch board (pine preferred, because it does not warp) are nailed crossways and fully incased in tin, locked and soldered, and thoroughly nailed under the locking, the outer surface of the wood under the tin will be speedily reduced to charcoal by the action of heat through the combustion of the small amount of oxygen under the tin. The charcoal itself then becomes a very effective non-conductor of heat, and if the tin is tight, so that no further supply of oxygen reaches the unburnt wood beneath the charcoal, it will remain cool and strong for some hours, thus giving time to control the fire where it starts.

## TRADE PUBLICATIONS.

### Designs for Floor and Hearth Tile.

The Star Encaustic Tile Co., Limited, Pittsburgh, Pa., have issued a neat oblong pamphlet in granite covers, with gilt side title, showing designs for hearth and floor tiles manufactured by them. The designs are to a uniform scale of ¾ inch to the foot, and are in colors, thus showing the effects produced by the employment of the tile represented. Some very handsome patterns are given, and in the circular that accompanies the pamphlet the special merits pertaining to the encaustic tile manufactured by this company are pointed out. A number of testimonials from persons who have used this company's production are also presented. Every builder who has occasion to use work of this kind will find it to his advantage to send for one of these pamphlets, and to put it away for reference. The use of tile in halls, vestibules, &c., is becoming more and more general, and the larger the fund of information the builder has upon this subject, the more ready will he be to comply with specifications intelligently.

### Wood-Working Machines.

Mr. Frank H. Clement, of Rochester, N. Y., has sent us a copy of his catalogue of improved wood-working machines for 1883. This is the twelfth annual catalogue issued by this manufacturer, and he states in a card published on the third page that the past 12 years have been devoted almost exclusively to the specialties he describes, in working up modern designs, in improving processes, lowering the cost of construction and raising the standard of workmanship. From this experience he has become familiar with every detail of the management of his factory, from which he is led to say that he can assure his customers of an ability to turn out more satisfactory work in his special line

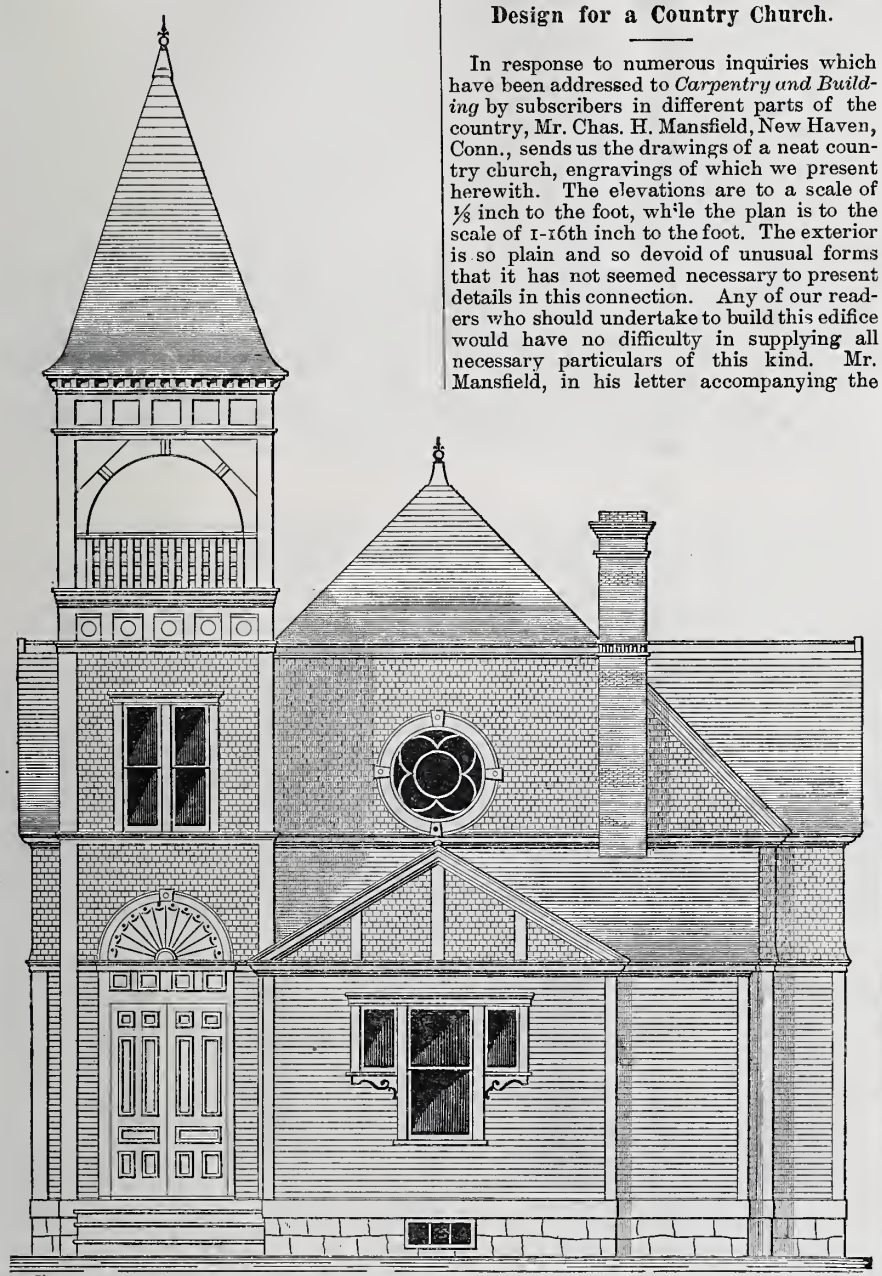
than any firm composed of mere capitalists or business men. We recently illustrated one of Mr. Clement's machines, so that our readers in some measure know the character of his workmanship and the nature of his improvements. Several pages of the catalogue before us are devoted to band-sawing machines, following which are presented horizontal boring machines, vertical boring machines, rod and doweling machines, portable scroll-sawing machines, wood-turning lathes and various apparatus useful about building establishments and planing mills. The catalogue has been very carefully prepared, each device being fully described, so as to make it of more use as a book of reference than many trade publications of this character.

### Slate Mantels.

Mr. Charles B. Kline, 420 North Third street, Philadelphia, Pa., has sent us a copy of his catalogue of new designs in slate mantels, low-down grates, &c. The catalogue, so far as mantels are concerned, contains nothing but designs, with the designating number or letter by which they are known in the trade. No descriptions or prices are given. The same may be said with reference to the grates shown, although some general remarks as to the benefits to be derived from open fires are given in the preface. This catalogue, as a means of communication between buyer and seller, is, no doubt, valuable up to a certain point. We think, however, the manufacturer missed it in not giving with his designs that information which the intelligent builder requires, and which at present he cannot get without tedious correspondence. More particulars would have been of mutual advantage, we think, because it would have saved the manufacturer answering many inquiries which are preliminary to an order. The designs are well engraved and show to advantage.

## Design for a Country Church.

In response to numerous inquiries which have been addressed to *Carpentry and Building* by subscribers in different parts of the country, Mr. Chas. H. Mansfield, New Haven, Conn., sends us the drawings of a neat country church, engravings of which we present herewith. The elevations are to a scale of ⅛ inch to the foot, while the plan is to the scale of 1-16th inch to the foot. The exterior is so plain and so devoid of unusual forms that it has not seemed necessary to present details in this connection. Any of our readers who should undertake to build this edifice would have no difficulty in supplying all necessary particulars of this kind. Mr. Mansfield, in his letter accompanying the drawings, states that the building was designed for erection near New Haven. The seating capacity is about 250, and the cost was estimated at $2500.



*Design for a Country Church.—Fig. 1.—Front Elvation.—Scale, ⅛ Inch to the Foot.*

In response to the attempt of the St. Louis City Council to collect from architects an annual license tax of $50, the latter have united in a protest against this action as illegal and unjust. While it is believed that architects are not taxed at all in other cities, the St Louis members of the profession express their willingness thus to contribute to the public revenues, provided the burden is made to bear equally on all who make plans and perform the duties of architects, but many of whom evade the license tax by calling themselves builders. They therefore recommend a modification of the city building law, to the effect that no permit shall be granted for the erection of any more buildings for which the plans have not been prepared by an architect who has paid the regular city license fee.

## CORRESPONDENCE.

### A Study in Suburban Architecture.

*From* Another Architect, *Birmingham, Conn.*—Alas, we are undone! Our objections have proved as nought before the sharp pen-point of Mr. Archie! And yet we would essay a few words more. Let us glance over the reply printed last month. He says we "forgot the customary courtesy indulged in by the reviewers—that of slurring with faint praise." We did not wish or intend to slur his work at all; but had we wished to do so, nothing could have answered our purpose more effectively than a little "faint praise." Mr. Archie puts us in an unwonted light when he intimates that we are a "reviewer." We have not yet attained to that dignity, but remain only critic. That there is much in his design that is admirable no one will deny, and had we a contract with the Editor for writing a review of the article, we certainly should have accorded the author his full share of praise; but when we attempted to call attention to what appeared to be defects, we did not intend our remarks to be a vehicle for soft-soap.

Mr. Archie is right—"Another Architect," being somewhat busy, did at first study the drawings without reading the text; but, thinking his eyes might have misled him concerning the drawings, he read and reread the text, hoping to discover some explanation of the apparent defects, but was not able to do so. With regard to that "stable-yard," we did not intend to follow a wrong impression "blindly to the end." The trouble is that we have not yet attained to the æsthetic conception of a stable-yard which evidently obtains in his vicinity. We don't keep our stable-yards turfed, and laid out like our lawns. Wherever we have been we have found it a universal fact that there is always more or less refuse matter from stables, which must be either kept inside or thrown into the yard; and as keeping it inside is out of the question, it will necessarily be thrown outside.

If we had at the outset been informed that Mr. Archie owned a farm a little further countryward it would have saved words. But in that case the thought comes up that the farm can't be many miles beyond, or the tenant would hardly be able to bring daily

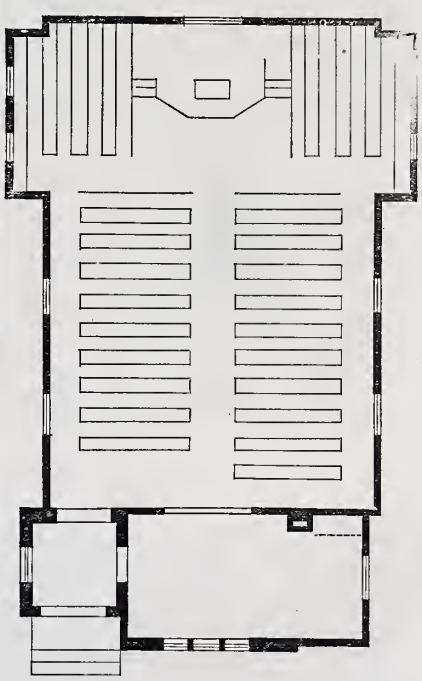


*Fig. 2.—Floor Plan.—Scale, 1-16th Inch to the Foot.*

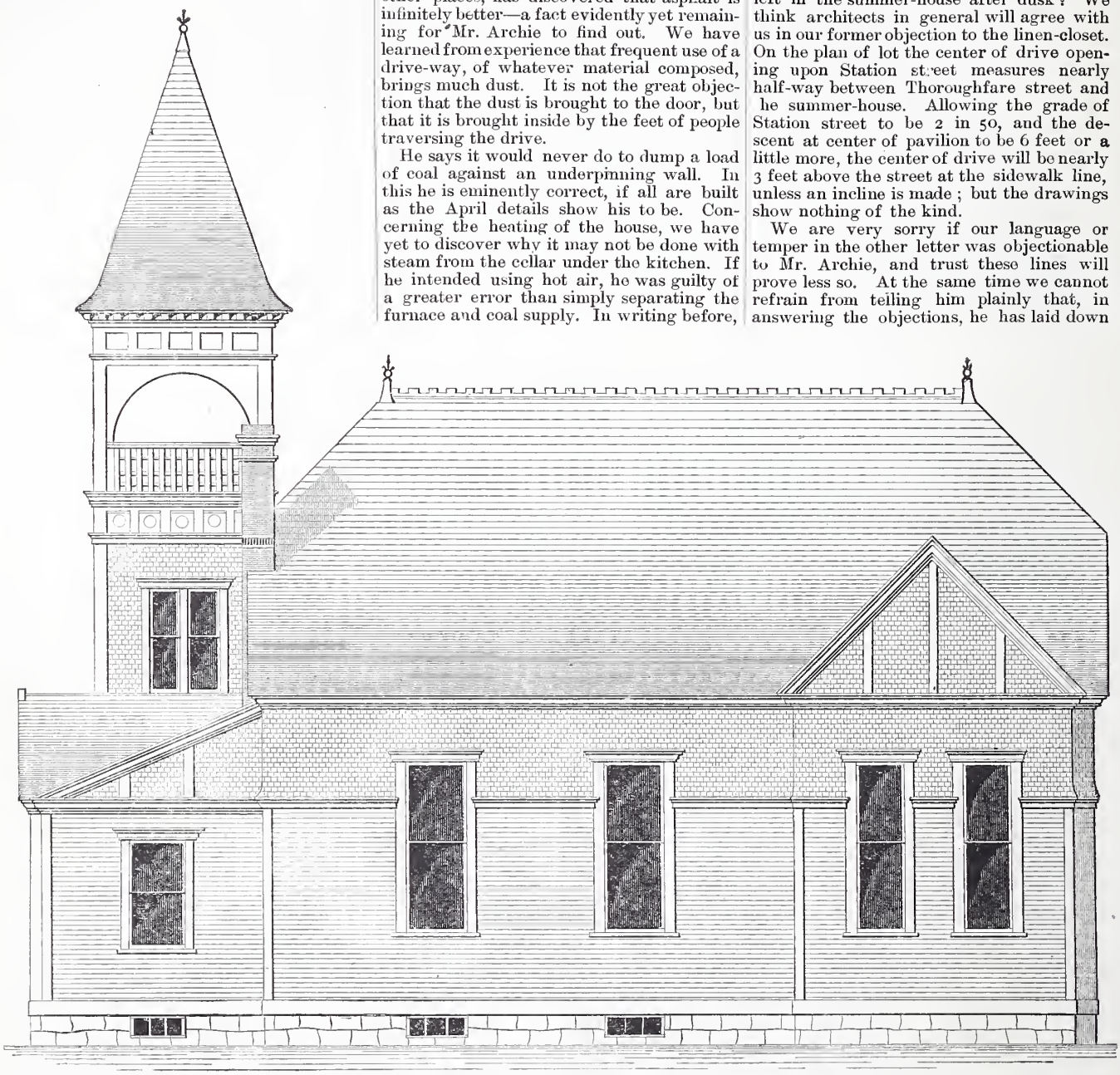
the milk for the table of the owner. And if this is the case, why did he not go there and build his residence? Distance can be no objection, for a man so well off as to possess not only a "pent-up city home," but a large house in the suburbs and a farm besides, could easily spare time enough to drive a few miles further. If we had only known about that farm, and those æsthetic horses!

Regarding the other side of the summer-house, it probably would not do to explain that we intended to say its occupant would be within 12 or 15 inches of the sidewalk line, as that would look like trying to back down; so we let it go that Archie has in this instance caught us. At the same time, we are not quite satisfied with the way he passes over our objection. In spite of his reasoning, the floor will be only a trifle more than 4 feet above a pipe in the mouth of any one passing. The other day, while looking out of our office window, we noticed a small cloud of smoke rising above the sill, and upon looking down, saw that it came from a tering trains) from our summer-house?" The next point, about "help" coming in through the stable-yard, hinges entirely upon the condition of said yard. If, as he says, the yard is clean, then it certainly is eligible as a passage between street and house. But if it is to be kept in this condition it is practically put on a par with the other yards, and "stable-yard" is a misnomer. It grieves us that he sees no other way for pedestrians to escape the carriage-way than to set his house directly in the street line. Birmingham some time since discovered the use of concrete for walks and drives, and of late, in common with the people of many other places, has discovered that asphalt is infinitely better—a fact evidently yet remaining for Mr. Archie to find out. We have learned from experience that frequent use of a drive-way, of whatever material composed, brings much dust. It is not the great objection that the dust is brought to the door, but that it is brought inside by the feet of people traversing the drive.

He says it would never do to dump a load of coal against an underpinning wall. In this he is eminently correct, if all are built as the April details show his to be. Concerning the heating of the house, we have yet to discover why it may not be done with steam from the cellar under the kitchen. If he intended using hot air, he was guilty of a greater error than simply separating the furnace and coal supply. In writing before, glass, which does not transmit much light, and which will require a keener pair of eyes than either Mr. or Mrs. A. possesses to pierce. We judge the glass to be colored by the broken lines, apparently indicating lead settings, which are not commonly used with clear glass.

He says he will not carry balls and mallets through the casement window, but will keep them under the piazza or in the summer-house. The former is out of the question, inasmuch as his stone underpinning is carried solidly around both piazzs, without any openings. Are his villarge urchins too high-minded to take possession of any implements left in the summer-house after dusk? We think architects in general will agree with us in our former objection to the linen-closet. On the plan of lot the center of drive opening upon Station street measures nearly half-way between Thoroughfare street and he summer-house. Allowing the grade of Station street to be 2 in 50, and the descent at center of pavilion to be 6 feet or a little more, the center of drive will be nearly 3 feet above the street at the sidewalk line, unless an incline is made; but the drawings show nothing of the kind.

We are very sorry if our language or temper in the other letter was objectionable to Mr. Archie, and trust these lines will prove less so. At the same time we cannot refrain from telling him plainly that, in answering the objections, he has laid down



*Design for a Country Church.—Fig. 3.—Side Elevation (Right).—Scale, ⅛ Inch to the Foot.*

man on the walk, some 22 or 23 feet below. This would apparently indicate that the occupant of Mr. A.'s summer-house would not be too high up to be annoyed by the aforesaid pipe. Allowing the floor to be, as he says, 2 feet above the 18-inch coping, the total hight would be 42 inches above grade of lawn. But on the drawing he shows only three risers in the steps, carrying him up not more than 24 inches. Does he jump the remaining 18 inches? No, he is not really obliged to do his heaviest reading there, nor is he obliged to go there at all except in case of a lawn party, when, with a lady companion, he could (provided Mrs. A. or the children did not see him), enjoy a delightful *tête-à-tête* in the angle formed by a public station street and a stable-yard.

Where in our last letter, we wonder, did he find out the secret "with reference to the exact distance of the railroad (with its clat-

we came very near not speaking of the ill-lighting of the upper hall, thinking he intended bringing light through the study. But a study is by all odds a room secluded from the rest of the house, and free from intrusion—much as we thought (mistakenly, it seems) a summer-house should be—and therefore we did not think it possible that he intended using space which in reality is a part of his public hall as a place for study, without first closing the large opening with a curtain—dare we say *portière*?—or otherwise, and thereby cutting off the light. As for "top lights," architects generally regard them as too ugly features to be willingly adopted in private houses, unless made of colored glass, in which case a pleasing effect is obtained at a sacrifice of light. We did not overlook the window over seat in main hall, but laid the thought aside, as all drawings of the front show it to be of broken colored

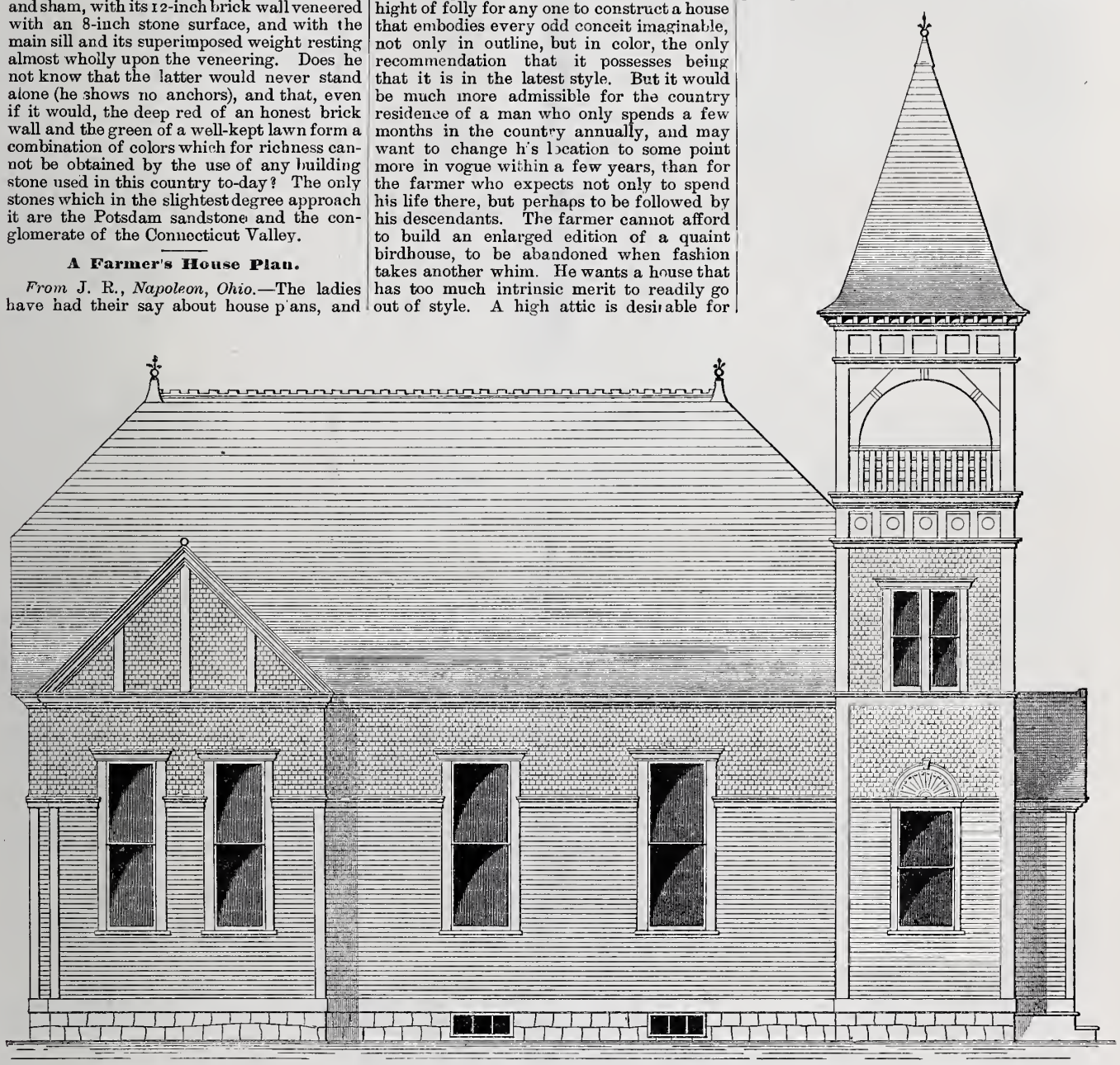
new conditions which we think were made up for the occasion, in order to overcome the objections. Take, for instance, the dairy-farm. Who, excepting himself, knew anything about it previous to the publication of the April paper? Then he says the stable-yard is not to be made a nuisance by the presence of stable refuse. He might as well have said the stables would never be sullied by the presence of horses. In computing the hight of summer-house above street, he says the yard coping is 1 foot 6 inches high. Compare it on the Station Street side, in the perspective drawing, with other objects at about the same distance. It shows a hight almost exactly equal to the diameter of a column in the kitchen porch, which cannot be more than 5 to 8 inches. The turning of the summer-house into a mere smoking-room is also something not down in the programme.

If we had not already taken up so much more space than we ought, we would have ventured to call his attention to the drawings published in the April number, in which, among other points, we notice that his first and second floor joists are of the same size as those in the attic, with double the amount of weight to sustain that the latter have. In the outside walls his studs are cut entirely through by the second-floor girt, and thereby greatly weakened. Why did he not cut in a 2 x 6 inch girt, which would bear any weight ever brought upon it, and would not have seriously weakened the studs? Then that underpinning wall is a model of ingenuity and sham, with its 12-inch brick wall veneered with an 8-inch stone surface, and with the main sill and its superimposed weight resting almost wholly upon the veneering. Does he not know that the latter would never stand alone (he shows no anchors), and that, even if it would, the deep red of an honest brick wall and the green of a well-kept lawn form a combination of colors which for richness cannot be obtained by the use of any building stone used in this country to-day? The only stones which in the slightest degree approach it are the Potsdam sandstone and the conglomerate of the Connecticut Valley.

### A Farmer's House Plan.

*From* J. R., *Napoleon, Ohio.*—The ladies have had their say about house plans, and not be less than 16 x 16 feet or 16 x 18 feet. The house ought to be compact, not only for economy in construction, but also economy in heating. The farmer does not want too much ornamentation of the exterior of his house, neither does he want a plain barn-looking building. He needs a building ornamented classically, of a pure style, that will readily harmonize with a well-kept lawn, orchard, garden, meadow and well-tilled grain fields, luxuriant and elegant nature subdued and cultured as found in the richer farming districts. These are, or at least ought to be, the general surroundings of a complete farm home. It seems the hight of folly for any one to construct a house that embodies every odd conceit imaginable, not only in outline, but in color, the only recommendation that it possesses being that it is in the latest style. But it would be much more admissible for the country residence of a man who only spends a few months in the country annually, and may want to change his location to some point more in vogue within a few years, than for the farmer who expects not only to spend his life there, but perhaps to be followed by his descendants. The farmer cannot afford to build an enlarged edition of a quaint birdhouse, to be abandoned when fashion takes another whim. He wants a house that has too much intrinsic merit to readily go out of style. A high attic is desirable for of what they want, and, when they build, often place themselves in the hands of builders who know but little more than the farmer. What can he do? The professional architect is so imbued with Queen Anneism and the other gimcrack styles that ten to one he would be of no assistance. When farmers generally appreciate the advantages of employing the services of really educated architects, then may we expect a change for the better.

I rather like the "Woman's House Plan." As C. N. C., of Alpena, Mich., seems rather a clever architect, I wish he would dress the plan up with a double French—concave, con-



*Design for a Country Church.—Fig. 4.—Side Elevation (Left).—Scale, ⅛ Inch to the Foot.*

well said, too, as far as they have gone, and the architect has aired his views. Now, there is a very large class who need houses—the farmers—and as I am a farmer I wish to give my opinion as to what plan of a house would meet his wants—that is, "the well-to-do farmer"—and at the same time say something about what kind of house he don't want. I find that almost everywhere farmers are beginning to replace their old cheap houses with buildings costing from $3000 to $8000, mostly brick, and slate roof, very substantial, unless it is the tinning around the roof. It seems a pity that something better cannot be found for valleys and flat parts of roofs than tin, which will have to be replaced in a few years, except such materials as will spoil the rainwater. The class of farmers I speak of need a house with not less than nine or ten rooms. The principal rooms on the ground floor should the protection of the second story, but the Gothic roof is too inharmonious amid farm surroundings to come into general favor, unless it is materially "modified." A house need neither be an unyielding block or the other extreme of a confused *mélange* of brackets and gables. The author of "The Reveries of a Batchelor" may amuse himself building an oddity of a hotch-potch of a house that he imagines in his half-waking moments is an ideal farm home without doing any one any harm (I like to read Ik Marvel's books, but do not want to live in houses of his planning). Farming is not what it was 200 years ago. Neither are farmers the same as at that time. The change has been gradual, but it is going on more rapidly than formerly. The sickle is no more a fit representative of a farmer's implement than the old-fashioned farm houses meet the needs of a modern farmer.

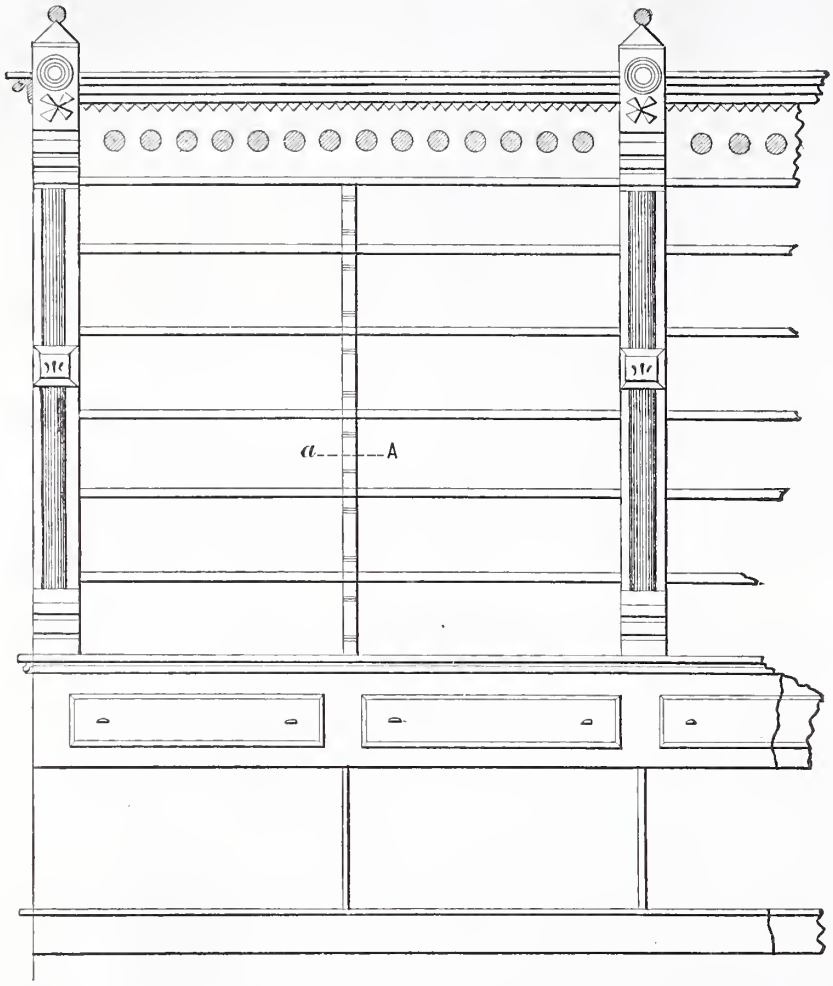
As a rule, farmers have rather vague ideas vex—roof; or a full Mansard roof, two stories high, not including attic, with verandas, not too numerous or too long; one bay window, two stories, and another one story high, a balcony having a view toward the front—well, perhaps, I have asked too much already, or I would add a tower. And I would also ask why it is that houses of late years are not surrounded by a terrace? And should a terrace conform to the outline of the ground plan of the building proper or to the building and verandas?

### Painting Tin Roofs.

*From* C. G. S.———There are many fallacies in regard to tin roofs that must be removed. I have known several builders—men considered to be eminently practical—who claimed that the tin should be allowed to get quite rusty before the first coat of paint was applied, as it would allow the paint to adhere

more firmly. Now, there should not be a particle of water allowed to touch a tin roof before painting, unless it is applied in the following manner: Make a weak solution of sal soda and wash over the whole surface with a stiff broom. This will remove the rosin or acid used in soldering, also the grease on the tin, making one of the best surfaces for paint to adhere to. The rosin should never be scraped from the seams with a putty knife or other metal implement, as is the common practice. In fact, it is better not to scrape it off at all, as the injury done to the plates is greater than any benefit derived, for in case it should cause the paint to peel, that will cause no injury to the roof, as the rosin will always be found on top of the solder, which will take no damage till the roof needs repainting.

The supposition is with many that, if they get a good tin roof, it will not need any attention for a long time. The fact is, it should receive the careful inspection of the tinman, and also the painter, at least every two years. In that time many of the seams of a flat-laid roof will have become broken by expansion and contraction, and the extreme exposure will have destroyed or changed the distinctive nature of the "oil," even if "mixed with vermillion" (which takes the least oil of any pigment known), as your correspondent, D. M. McC., suggests. Therefore, as often as every two years a tin roof should have a good, solid coat of paint, and, in applying, it should not be rubbed out, but put on all that will stay without running, of a medium consistency. As regards the kind of paint to be used, I have, after more than 25 years' practical trial, found that the mineral paints, like Prince's metallic, mixed with raw linseed oil, make the very best, being, according to my observation, more durable than yellow ocher or other substances that take a trifle more oil. Nearly every district of the United States has to periodically suffer the infliction of coal tar, in some form or other, as a roof coating, for which, in my opinion, it is entirely unsuited. If it was not for spoiling the water, it would seem to answer this purpose for the first few months after it is applied, but, as the evaporation of the more volatile portion takes place, there will be nothing left but a resinous coating, which the water will penetrate quite readily, frequently causing a corrosion of the plates underneath that may escape notice until entirely destroyed. The cost of paiuting a roof as above, two coats, would be about 10 cents per square yard, one coat in proportion. Thus the cost of keeping a roof well coated




*Counters and Shelving.—Fig. 1.—Elevation of Shelving.—Scale, ½ Inch to the Foot.*

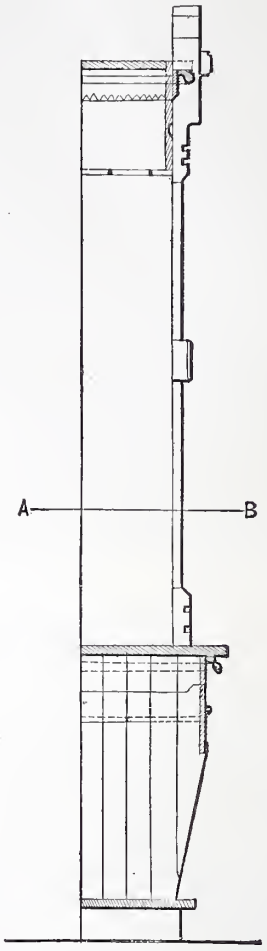



*Fig. 2.—End of Shelving.*

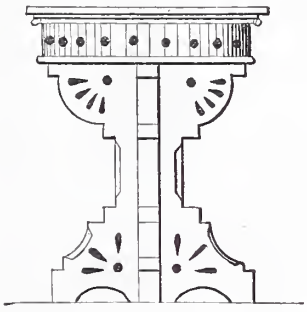


*Fig. 3.—End Elevation of Counter.*

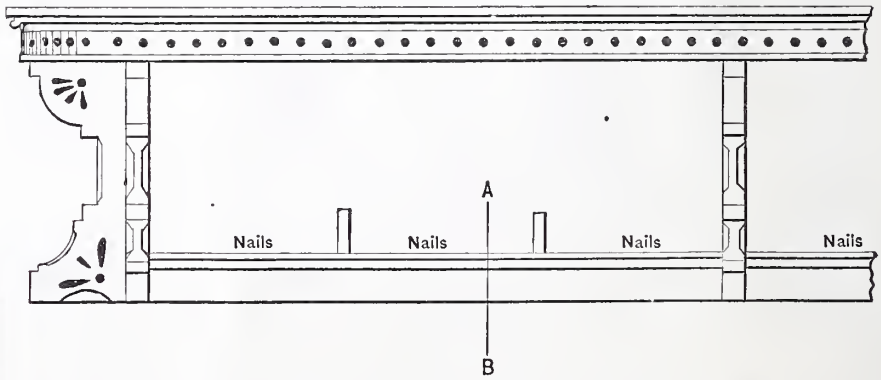
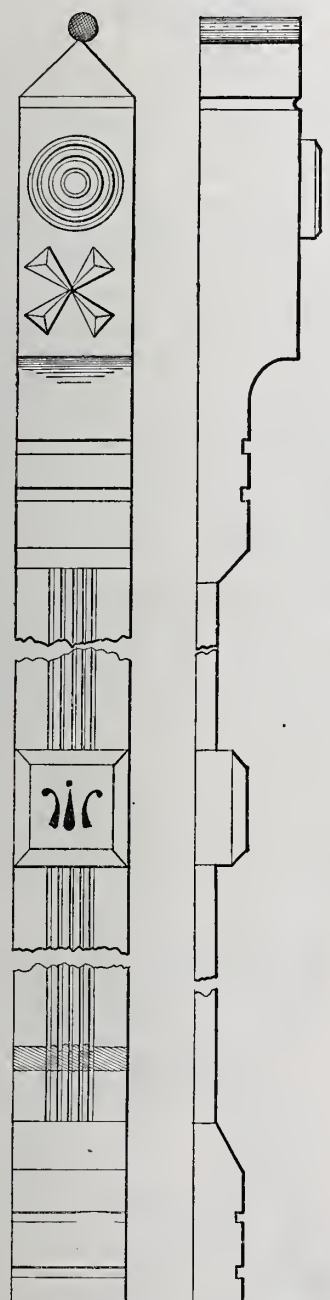



*Fig. 4.—Front Elevation of Counter.—Scale, ½ Inch to the Foot.*

*Fig. 5.—Plan of Counter.—Scale, ½ Inch to the Foot.*

would amount to much less than is many times paid for experimenting with doubtful preparations.

*Note.*—Our correspondent's letter is eminently sensible, and hardly needs any words of comment from us. There is so much misapprehension in repard to the painting of a tin roof, and it is so deeply seated in the minds of the tinmen, that it seems almost impossible to make them understand the reasons why certain things should be done, and why certain others should not be. In the matter of rusting, for example, they ought to understand a little of the chemistry of oil, paint and iron rusting. The oil itself, which is the protecting medium, forms a coating or a varnish on the surface by absorbing oxygen from the air. Unfortunately, when it has formed a sufficient amount to produce a good surface, we are unable to stop the action, and consequently it goes on until the varnish is entirely disintegrated and washes off in the form of a



*Counters and Shelving.—Fig. 6.—Detail of Pilaster.—Scale, 1½ Inches to the Foot.*

powder. If the metal beneath still retains its covering of tin, so long as the paint is in good enough condition to prevent the water from penetrating, no harm will follow. When, however, the tin is allowed to become rusty before the paint is applied, a new action is set up. The rust absorbs the oxygen from the oil and parts with it to the clean metal beneath. The oil taking the oxygen from the air in the first place parts with it to the metal below, and so the work goes on until the rusting is accomplished and the metal worn out or entirely rusted out. When once rusting commences it is useless to undertake to stop it by the application of oil or paint. The rusting continues underneath uninterruptedly. The only remedy is a clean surface, free from rust, and in tin plate this is best obtained by putting the paint on before the rust makes its appearance

### Counters and Shelving.

*From* J. W. B., *Kansas City, Mo.*—In reply to your correspondent, F. D. G., of Fort Worth, Texas, and for the benefit of other

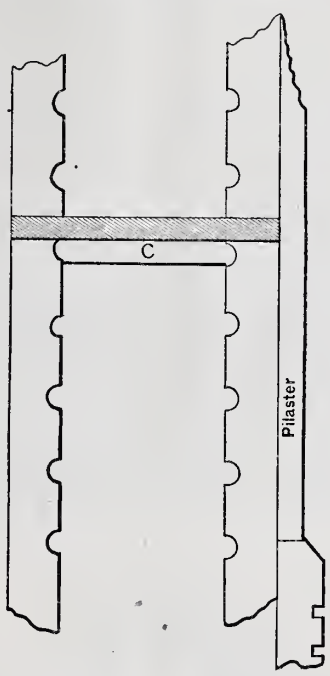



*Fig. 7.—Section Through Line A B, Fig. 2.—Scale, 1½ Inches to the Foot.*

readers of *Carpentry and Building*, I submit the inclosed designs of counters and shelves for a hardware store. I suggest that the principal part of this work be built of hard pine, finished with shellac and varnish, and trimmed with black and red. I have put up shelving similar to this design, finished as above, and the effect has been very pleasing.

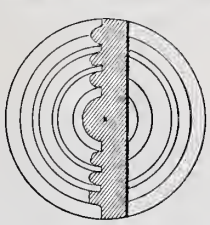


*Fig. 8.—Rosette on Pilaster.*

I would direct special attention to the drawer guide shown in one of the sketches. I think this device a very desirable one, as it prevents the drawers from wedging at the corners, as wide drawers filled with heavy articles are very apt to do.

### Question of Contract.

*From* J. H. R., *Corry, Pa.*—In the case of a contract between a carpenter and a house owner, in which the carpenter agrees to do

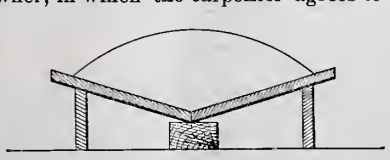


*Fig. 9.—Section Through Nail Bin, A B.—Fig. 4.—Scale, ¾ Inch to the Foot.*

all the work on a specified building and furnish all the materials except the hardware, the owner agreeing to furnish the latter, I would like to know whether the owner or the carpenter is bound to furnish the glass for the windows? In other words, does the glass belong to the hardware bill or the lumber bill? The glass is not specifically mentioned in the contract, but the sizes of the sash are specified.

*Answer.*—The decision of a question of this kind must depend very much upon local usages. In cities and large country jobs the glass would not be considered a part of either hardware bill or lumber bill. It is true that glass in many cases is bought through the hardware store and becomes a part of what is usually termed the hardware bill. In other cases and in different sections of the country the glass is bought through the lumber dealer, and in the same manner becomes a part of the lumber bill. From this it is evident that no rule applicable in all cases can be laid down. On large work and in city work the glass would be bought directly from a dealer in glass, and would not in any way appear to be a part of either lumber or hardware bill. If contracts of the

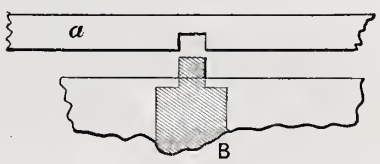



*Fig. 10.—Center Guide for Drawers; a, Bottom of Drawer; B, Guide.*

kind described by our correspondent are usual in the section of the country in which he resides, it is possible the dispute may be settled by precedent or common usage; otherwise we do not see how a solution can be reached save by negotiation or compromise.

### Bad Acoustics.

*From* G. V. S., *Ludington, Mich.*—I desire to learn, through *Carpentry and Building*, how to correct the acoustics of a hall, The room in question is 50 by 100 feet with an arched ceiling 35 feet high in the center and 22 feet on the sides. Across the front end are offices 16 feet wide with 10-foot ceilings. Overhead is a gallery. The stage is 20 by 40 feet, with 4-foot rise. The hall is very difficult to hear in. What can be done to better it?

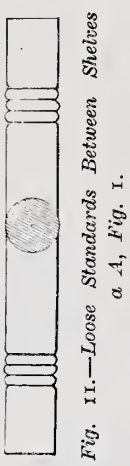
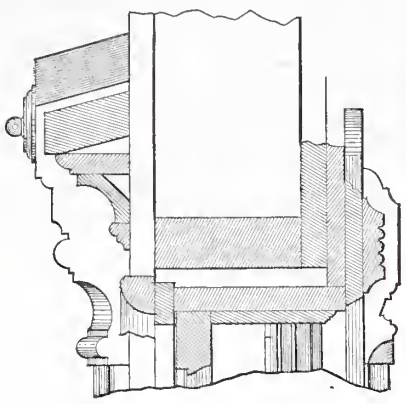


*Fig. 11.—Loose Standards Between Shelves a A, Fig. 1.*

*Answer.*—This question is one that can hardly be answered satisfactorily in the columns of a paper like *Carpentry and Building*. In fact, nothing short of careful experiment will determine what can be done to remedy a room the acoustics of which are bad. The room, as our correspondent describes it, is one well calculated to defeat the very purpose for which it was constructed. The arched ceiling is no doubt in a measure responsible for the reverberation that takes place; but how the same can be corrected by any simpler means than destroying what has been done and rebuilding is, as we have said above, a question that we are unable to answer, and regarding which we can only make a few suggestions. There are one or two cheap works on acoustics in which the general principles of construction are given, and which it would be well for our correspondent to read. Among these may be mentioned "Acoustics of Public Buildings," the price of which is 60 cents. This little work contains a great deal of information which it would be well for every one interested in the construction of public buildings to read. One of the first suggestions that is usually made in a case of this sort is to stretch wires along the upper part of the hall, so as to break up the reverberations and prevent the echo. The number of these wires is likely to be so great, if any advantage is to be derived from them, as to

make the plan impracticable. Drapery at the ends of the hall, and, if possible, in the arch of the roof, would probably do very much toward improving the hall. The effect of this can be tried without much expense, a couple of large flags being sufficient to demonstrate the value of the suggestions. Very large ribs and moldings in the arch might possibly be advantageous. Long and narrow halls are usually difficult to speak in, acting very like a speaking trumpet, and sending the voice forward to the further end with such force as to make unpleasant



*Box Window Frames.—Fig.* 1.—*Section through Head Jamb and Cap, with Side View of Bracket in Place of Corner Block. —Scale,* 1½ *Inches to the Foot.*

and stunning echoes. No doubt some improvement would be made if the roof were flat instead of arched, and it might be that a false ceiling would do something toward remedying the faults. From this, however, little could be expected, and we must confess that we should have very little hope of making a room of such proportions agreeable for either hearer or speaker. We do not remember, in all our experience, a room having good acoustic properties that was long and narrow. In such a room, however, when the speaker is placed at one end, the discomfort reaches its maximum, and the echo is frequently so great as to make it absolutely necessary for a pause after each word in order to be intelligible to the audience. There was in Cincinnati, eight or ten years ago, a hall very similarly proportioned to that mentioned by our correspondent, but with a flat ceiling. In this room it was almost impossible for a person to distinguish anything said upon the stage unless the speaker put a comma, so to speak, between all his words. Carpeting, hangings, and a variety of drapery at the side and across in the space overhead, by deadening the reflecting surfaces and breaking up the resonant qualities of the hall, enables the

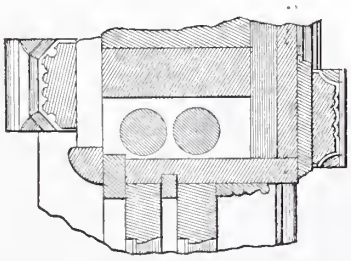


*Fig.* 2.—*Section Through Jamb Finish at Side of Windows.*

voice to be heard very much as it would be in the open air. This is about the extent of the improvements that is possible in such cases.

### Box Window Frames.

*From* W. W. C., *Mayville, N. Y.*—I notice in the February number of *Carpentry and Building* several designs for box window frames, some of which I desire to criticise. In the first place, the half-round edge of check and blind stops shown in Fig. 5 of the sketches makes the fitting of the check-rail very difficult, besides lessening the bearing surface of the sash and hiding as much of the sash as would be the case were it square. Again, where the side of the box is on a line with the outside of sash, the weight will rub and the full effect will not be obtained. This is especially true of weights larger in diameter than the thickness of the sash. This, however, is sometimes necessary to avoid too great length. I generally employ 1¾-inch weights with 1½-inch sash, &c. The pulleys shown by T. H. S. are not large enough for the thickness of pulley stile shown. They should project into the box a trifle more than one-half the diameter of the weight. In order to obtain the best results the weight should be hung in the box clear of everything.

I send a tracing from a detail of window finish I have designed for a house in this place that is now on my boards. I beg leave to call the attention of the readers to the ovolo introduced between the ends of siding and blind-stop. This method of construction effectually shuts out both wind and water from following the V (or other molding in siding) under the casing. The outside casing, or finish that corresponds, is entirely separate and is planted on the siding. To set frames in this manner, project the siding over the face of the window studs sufficiently to saw down by plumb-lines just right to receive the molding. Set the groove in sill on the siding at the bottom. Fasten jambs at top to block above pulleys and against studs; then nail ovolo to siding and blind-stop, using paint on the ends of siding if possible. I have built one house in this manner and had no difficulty. I submit the siding shown, in competition with several styles published in

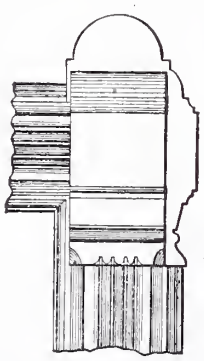


*Fig.* 3.—*Face View of Corner of Inside Casing and Bracket to be Used in Place of Corner Block. Rosette to be Used on Square.*

the volume of *Carpentry and Building* for last year. I first designed it for the Hotel Athenæum, at Chautauqua, and used over 60,000 feet on that building. It has the advantage of draining water from the joint readily, and admits of blind-nailing without allowing the water to follow the nail. The manner of finishing the head jamb without mitering the stop across commends itself to any one who has seen a woman take out a window. I trust that other readers of the paper will contribute something on this subject, and that it may be fully discussed.

### Tool for Scribing Skirting.

*From* W. W. P., *East Fairfield, Ohio.*—I desire to learn, through *Carpentry and Building*, something concerning an instrument used by stair-builders for scribing down skirting on steps and risers. I would like to have such an explanation as will enable one to build a tool for his own use.

*Note.*—Inquiry among stair builders in this vicinity reveals the fact that tools of this kind are not employed to any great extent here, although some with whom we conversed were under the impression that they were used to a greater or less extent in the Eastern States, and particularly in the neighborhood of Boston. Accordingly, we refer this inquiry to our readers, with the hope that some one in Boston or vicinity will reply to this correspondent. We shall be glad to have sketches of the tool, engravings from which will enable our correspondent to make the article as he suggests.

### Screw-Driver with a Spiral Shank.

*From* W. A. F., *Lima, N. Y.*—I desire to learn, through *Carpentry and Building*, where I can obtain a screw-driver with a spiral

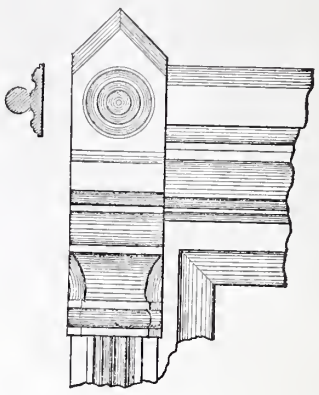


*Fig.* 4.—*Face View of Corner of Outside Finish and Bracket.*

shank. By simply pressing against the screw, the driver slides by means of a spiral thread in the handle, thus sending the screw home. I used an article of this kind last season, but have failed to find one in this neighborhood.

*Note.*—Another correspondent raised a question of this general character a month or two since, which was replied to. Among our "Novelties" in the last issue will be found a drilling device embodying some of the principles here indicated. It is possible that correspondence with the manufacturers of this tool will produce the information desired. It is possible, also, that a screw-driver might be substituted for a drill in the apparatus named.

### Paint for Galvanized Iron Cornice Work.

*From* J. C., *Lawrence, Kan.*—Can you tell me what is the best paint for galvanized-iron cornice work, and what particular process ought to be employed—that is, if there is any—to make it hold well? My experience has been that ordinary paint peels off in a short time.

*Answer.*—A good authority on painting ironwork of all kinds says that one of the great secrets of making paint adhere is, in the first place, to have the surface well cleaned. The next is to use boiled oil without any dryer being added, and the coat

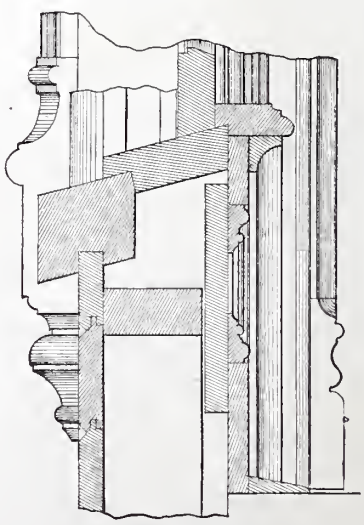


*Fig.* 5.—*Section Through Window Sill and Panel.*

should be put on just as thin as it is possible to lay it. Only so much is put on as can be made to cover by hard brushing. It is generally thought that the umbers or ochers form a better coloring matter for metal than

lead or zinc. The trouble with paint peeling from galvanized iron is a very general one, and we have discussed it frequently in our columns. Still, it seems that further information and exchange of experience, to say the least, will be profitable. Will not some of our readers favor us with their practice and experience in this matter of painting ironwork of all kinds, including galvanized as well as black?

### Steam Heating for Small Houses.

*From* J. K., *Jersey City, N. J.*—Would you please inform me whether there is any steam-heating apparatus adapted for an ordinary dwelling—one that is simple, cheap,

*Box Window Frames.—Fig. 6.—Bracket to be Used on Doors or Windows that Reach the Floor, in Place of Bracket Shown in Fig 5.*

safe and economical? Can you give me any information as to the cost of heating with steam a small house—say a two-story house of five or six rooms?

*Answer.*—While there are a great many systems of steam heating which are considered cheap, reliable, safe and economical, there are certain considerations involved in steam heating which make it less applicable to a small house than furnaces or stoves. To be safe and economical it is necessary to have a considerable amount of apparatus, and this, although it may be cheap, necessarily, from the quantity employed, costs a

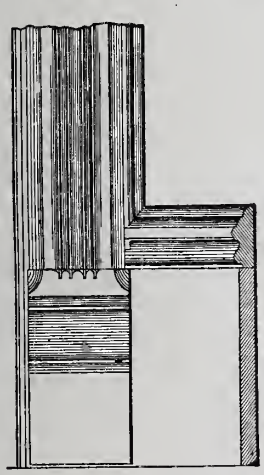


*Fig. 7.—Face of Plinth and Section of Base.*

considerable amount of money. The boiler, boiler setting, fittings, feeding apparatus and regulators would cost very nearly as much for four rooms as they would for ten or twenty; hence there is no small amount of difficulty in designing or building an apparatus of this kind to be used on a very limited scale. We had an estimate not long ago from a gentleman for heating a three-story city house 20 feet front, and, if we remember the figures correctly, the cost was not far from $450. Since that time a good many cheaper boilers have been brought into the market, and the cost of their attachments has been reduced somewhat. We are under the impression that there are one or two makers who furnish a boiler which could be put into a house and would work with satisfaction. Most of the steam-heating firms are too busy with large jobs to undertake anything in the way of small work. The large business is more than they can attend to, and altogether too profitable to be given up for small work.

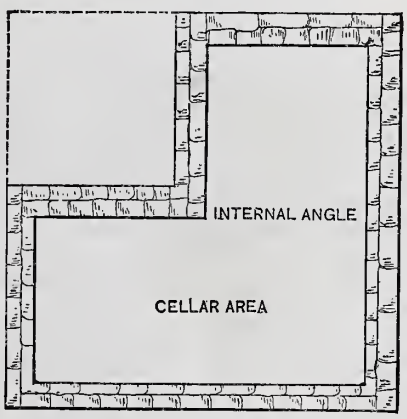
### Cornice Projections.

*From* M. T., *Dorchester, Neb.*—I should like to ask the rule, if any there be, of cornice projection. Some say that a building 12 feet high should have a cornice projection of 12 inches, and for one 16 feet high the cornice should project 16 inches, and so on. Now, if there is any definite rule for the projection of cornices, I would be glad to learn all about it from some of the many readers of *Carpentry and Building.*

*Answer.*—There is no rule. It is simply a matter of taste. We shall be pleased to receive letters from correspondents in various sections of the country, describing the method in practice in the community in which they live.

### Measurement of Mason's Work.

*From* C. A. M., *Cambridgeport, Mass.*—The sketch accompanying my letter published on page 15 of the January issue was misunderstood. As shown, the internal angle was made to refer to a section in the wall or an offset. What had been intended, as many of your readers have no doubt detected before this, was an internal angle in the plan of the cellar; accordingly, I send a new diagram, which I trust will be understood, and which I hope will be inserted in order to make me right before your readers. The internal angle shown in this diagram is




*Measurement of Masonry.—C. A. M's Correction.*

measured extra, the hight being multiplied by the thickness—that is, 16 inches times 16 inches times 5 feet 6 inches. This will be understood by reference to the former communication above mentioned.

*Note.*—This correction from our correspondent was duly received soon after our January issue made its appearance, but the crowded condition of our columns has made it impossible to publish it earlier.

*From* A. H. W., *Salt Lake City.*—In reply to T. N. F., of Philadelphia, I would say that, according to the custom in use in this city and vicinity, there would be 58⅔ perches, or 7 9-16ths cords, quarry measure, in the walls as given in his sketch, also the same for masons' measure. We measure all walls less than 18 inches in width as 18 inches, and count all openings as solid. It is customary here for quarrymen to take masons' measures for the amount of rock in the walls.

### Heel of a Brace for a Gate Post.

*From* F. N. T., *Philadelphia, Pa.*—In the February number, page 40, J. H. B., of Germantown, asks the proper way of getting the heel of a brace for a gate-post. Having lived on a farm where such construction is often employed, I would recommend the construction shown in Fig. 1, given on that page. Braces of this character are nice for the pigs and hogs to stand under to rub their backs. Let a good-sized hog get a few times under a brace constructed as shown in Fig. 2, and he would soon raise it at the heel; whereas Fig. 1, it is evident, would be much better under these circumstances.

*Note.*—This correspondent's comments and recommendation show how many things besides the best principles of construction are to be considered in some kinds of work. What would brace the post best, it seems, is least serviceable to the hog, and therefore must be condemned.

### Boring Square Holes.

*From* E. C. B., *Winsted, Conn.*—Referring to the inquiry in a recent issue of *Carpentry and Building* for a machine to bore square holes, I would say that if your correspondent will get No. 20, Vol. 39, new series, of the *Scientific American*, dated November 16, 1878, he will find on page 311 an illustrated description of a machine for drilling square holes. Whether this same device will bore a square hole in wood I cannot say. It is the only machine, however, that I ever saw that pretended to do work of this character.

*From* F. W., *Norwalk, N. Y.*—The question asked regarding a machine to bore a square hole, in a recent issue of *Carpentry and Building*, reminds me that some 40 years ago at a machine shop in this place there was made a device for doing such work. The machine was made for the patentees, and for the first time. The essential features embraced a hollow, square chisel of the size of the required mortise, the interior of which was filled with a row of auger bits. The bits were as large and as many in number as the hollow would contain and leave sufficient thickness for the sides of the chisel. The bits were geared in the chisel so that the chisel sunk with the bits and squared the hole. Three or four sizes were made, but they were taken away from here. Consequently, I do not know whether the machine was a success. Only the manufacture to which I have referred was ever attempted at this place, and I have never since heard of the machine, from which I presume the expectations of the patentees were not realized.

*From* J. T. W., *Columbus, Ga.*—On page 82 in No. 53 of *Carpentry and Building* I noticed that some one asked about a machine for boring a square hole. There is such a machine in the market, and it is made by Messrs. Greenlee Brothers & Co., of Chicago, Ill. We have one in our shop, and employ it for mortising sash, &c. The device is a hollow chisel that is stationary, with an auger bit running in it. The auger draws out all the cores and leaves the mortise clean.

### Schedule for Estimating.

*From* F. W. S., *Green Castle, Ind.*—I noticed in the columns of *Carpentry and Building*, some time since, a schedule for estimating work, submitted by one of your readers. As I believe the subject is one of deep interest to the craft generally, I take the opportunity of sending you a copy of a schedule in use at this place by an association of carpenters and builders. If its publication will lead to intelligent criticism, it will doubtless be of benefit to all concerned. The schedule is intended to be used by builders in making all estimates. When filled out and indorsed with the name of the owner and character of work to be done, it is filed away for reference. Some explanation of the schedule is probably necessary. For example, it will be noticed that there is no mention of gas-fitting and plumbing. This schedule was intended for use in a country town of about 5000 inhabitants, where there is not as yet either gas or water works; consequently we are not required to estimate these items. The intention was to leave three or more blank lines above the total item for the insertion of special items not included in the printed form. Five hundred copies of this schedule were printed at the expense of the association and divided among the members as an experiment, with the understanding that if they were found useful the schedules were to be continued, with such improvements in the next lot as experience might suggest. I believe that not a single objection has so far been made, and the general verdict is, "A

good thing." The schedule was gotten up as an attempt at systematizing the making of estimates, and to substitute detail estimates for wild guessing as to the cost of work. It was also believed that by their use there would be avoided the error of omitting part of the work or material. The association of carpenters and builders spoken of has some features that are new, and which are thought by the members to be valuable. Should the Editor so desire, I shall be glad to present an account of the organization to the readers of the paper.

*Note.*—In response to our correspondent's suggestion above, we have written him that an account of the association referred to will be of interest to our readers, and have requested that he prepare the same at his earliest convenieuce. The fact of carpenters and builders associating themselves together to perfect their business methods is something out of the ordinary way in which things are done. Accordingly, a statement of the object and results of the association, together with its workings, will certainly be of great interest to the craft at large. The following is the schedule referred to by our correspondent:

*Estimate for M..... ....*

*Date.....*

Excavation..... $
Rubble stone.....
Cut stone.....
Brickwork.....
Tin and galvanized iron.....
Hardware.....
Painting.....
Plastering.....
Slating.....
Shingles.....
Frame lumber.....
Sheeting and sheathing.....
Siding.....
Cornice and corner boards.....
Flooring and ceiling.....
Inside finish.....
Door frames.....
Window frames.....
Doors.....
Sash., glass and transpoms.....
Blinds.....
Verandas.....
Stairs.....
Drayage.....
Insurance.....
Mill work.....

Total..... $
Builder's profit, 10 per cent.....
Carpentry—see below.....

Amount of estimate..... $

CARPENTRY ESTIMATE.

Feet.
..... Sill framing..... $
..... First floor complete.....
..... Second and third floor complete.....
..... Ceilings complete.....
..... O. s. wall complete.....
..... I. s. wall complete.....
..... Sliding-door wall complete.....
..... Roof, flat, complete.....
..... Roof, pitched, complete.....
..... Cornice, main, complete.....
..... Cornice, rear, complete.....
..... Hips and valleys, complete.....
..... Cresting complete.....
..... Balustrade complete.....
..... Outside base complete.....
..... Corner boards complete.....
..... Belt course complete.....
..... Inside base complete.....
..... Inside base complete.....
..... Wainscot compl-te.....
..... Wainscot complete.....
Set Casings complete.....
Set Casings complete.....
Outside doors complete.....
Inside doors complete.....
Sliding doors complete.....
Windows, com, complete.....
Windows, bay, complete.....
Closets, com., complete.....
Pantries complete.....
Sinks complete.....
Verandas complete.....
Stairs complete.....
Steps complete.....
Blinds complete.....

Total estimate..... $

### Technical Schools.

*From* T. D. S., *New York.*—In the excellent notice of the technical schools of New York, in answer to a correspondent, published on page 37 of the current volume, you omitted to mention one of the oldest and most worthy. I refer to the school of the General Society of Mechanics and Tradesmen of the City of New York, located in the same building as the Apprentices' Library, namely, 18 East Sixteenth street. Both the school and library are free. The school accommodates about 300 men and boys and 50 female pupils. The instruction is in practical drafting, architecture and carpentry, machinery and ornamental free-hand drawing. The school is open four nights each week from October to April.

### Millwright's Square.

*From* S. F., *Clay City, Ill.*—Answering the inquiry of a correspondent in a recent issue of *Carpentry and Building*, I would say that Messrs. Darling, Brown & Sharpe, of Providence, R. I., manufacture a millwright's square of the character about which he inquires. I have no doubt it can be purchased through the general hardware trade.

*From* D. L. K., *St. Paul, Minn.*—Answering the inquiry of J. M., of South Springfield, Mass., I would say that he can get a millwright's square by addressing Messrs. Darling, Brown & Sharpe, Providence, R. I. They make the best square for the purpose with which I am acquainted.

### Hard Finishing a Whitewashed Wall.

*From* G., *San Antonio, Tex.*—I have recently purchased a house in which the plastering has been finished by browning and whitewashing. Is there any way to put on hard finish without first cleaning off the whitewash?

*Answer.*—Our correspondent will have no difficulty in applying his hard finish if he first hacks the old wall with a hatchet. If, however, there should be any soiled or greasy spots on the whitewashed wall, there is always the liability that they will show through the hard finish.

### Palmer's Plane Irons.

*From* I. F. D., *Lunenburg, Mass.*—In reply to J. C. R., who inquired in a recent issue concerning Palmer's plane irons, I would say that if he will correspond with the Metallic Plane Co., 3 Green street, Auburn, N. Y., he will probably obtain such information as he desires. They are now manufacturing a different style, but I believe have a stock of the old kind on hand.

### Pitch of Rafters.

*From* J. P. F., *Chilton, Wis.*—In the article, "Pitch of Rafters," page 14, January issue for 1883, your correspondent, W. M., is wrong by .21 inch. The exact length of rafter under the conditions named is 10 feet 9.79 inches. W. M. is near enough for all practical purposes, but in his remarks he would lead readers to infer he was mathematically correct; hence attention is directed to his erroneous conclusions.

### Deadening Floors.

*From* J. B. T., *Lewiston, Pa.*—In answer to the inquiry from W. K., Chatham, Ont., I would say, lay the floors as usual, of matched boards. Put on top of floor directly over the joists, from one end to the other, a piece 2 by 3 inches, laid the 2-inch way. Make a mortar the same as for plastering and fill in between the pieces last mentioned. Lay a floor of matched boards on top of this, being careful to nail to the 2 by 3 inch pieces. Plaster the ceiling underneath, the same as with any other ceiling. From my experience this is the best and only reliable way of deadening.

### Construction of Ice-Box.

*From* R., *Gardiner, Me.*—I was very glad to see in a recent issue of *Carpentry and Building* so good a representation of my idea of a grocer's ice-chest. I regret to say, however, that the engraver has not got the thing just as I intended it in all respects. I leave the sides open. Along the top I put on a strip from end to end to keep the sides from spreading against the walls of the refrigerator. This construction lets the cold air down over the sides. By nailing a strip on the bottom on each side 1 inch deep the pan is made. I trust this additional explanation will make my former description entirely intelligible.

## STRAY CHIPS.

A CORRESPONDENT WRITES us from Atchison, Kan., that new buildings, both public and private, are going up in that place, and that the supply of brick and mechanics is hardly equal to the demand.

MINNEAPOLIS, MINN., is to have a new hotel building, the contracts having already been let for its erection. The structure will be fire-proof, having iron joists and a considerable quantity of fire-proof plates, sheathing floors and walls. It is hoped that the building will be ready for partial occupancy by June 1, 1884. The cost is put at $750,000, with $250,000 added for furnishings.

THE PLANS have recently been prepared by Mr. A. C. Nash, of Cincinnati, for a building to be erected at Delhi, Ohio, by the Catholics, as a home for worn-out priests. The building will be 126 feet in length, four stories in hight, and so arranged that another building of the same size and shape may be put up at some future time. The outside walls for three stories will be of native limestone relieved with freestone. The fourth story will be a mansard roof. The cost is about $75,000.

A BRICK residence for Dr. John E. McGill is about to be put up at South Bend, Ind., by Mr. F. H. Waescher, architect, of Chicago. The structure will be 46 x 67 feet in size, two stories, with attic and basement. The of style architecture will be Queen Anne. The cost is estimated at $15,000.

THE ADVANCE THRASHING MACHINE CO., located at Battle Creek, Mich., are putting up a shop at that place that is estimated to cost, when completed, $400,000.

MR. GEORGE A. FREDERICK, architect, of Baltimore, Md., has recently prepared drawings for a rectory for the Church of the Holy Martyrs, that is to be put up on the corner of Mount and Lombard streets, that city. The building will be 37 x 40 feet in size and three stories in hight. It will be constructed of brick and stone and cost $7000.

THE PLANS are about completed for a Congregational Church, having a seating capacity for 600 persons, that will be erected at Muskegan, Mich., this summer. The cost is estimated at $12,000.

PLANS HAVE recently been completed by Messrs. Silsbee & Kent for a private residence at Louisville, Ky., for Mr. H. T. Tilford. The building will be constructed of pressed brick, with cut-stone trimmings, and will be three stories in hight. The style of architecture will be Queen Anne. The roof will be of red tile. The cost is estimated at between $10,000 and $12,000.

A BUILDING for the Academy of the Sacred Heart is soon to be elected at Grasse Point, Wayne County, Mich. The structure will be 55 x 170 feet in size, four stories and basement, and will be built of brick and stone. The estimated cost is $80,000. Mr. William Shickel, of New York, is the architect.

THE DUTRO CAR WHEEL CO., of St. Louis, have sold their old location to the Union Depot Co. for track room, and are now removing their extensive works and rebuilding them a mile west of their former site. The new works will doubtless contain all the latest improvements in heavy foundry plant, as the company is known as one of the most enterprising in the city.

THE WORK ON the St. Louis Custom House progresses now without interruption by the weather, the building being completely inclosed. Much of the plastering is already done, the ironwork is nearly completed, and the heating apparatus is well advanced. At the present rate of progress the building may perhaps be completed within another year.

MR. EDWARD S. HAMMATT, to whom was awarded the first prize in the competition in elevations and details of the eight-room house, published in the issue of *Carpentry and Building* for July, 1882, has lately removed from Albany, N. Y., to Davenport, Iowa, where he will continue the practice of his profession.

MRS. PHILIP MEYER has had plans prepared by Mr. George A. Frederick, architect, for two 4-story buildings on Gay street, between Exeter and East streets, Baltimore, Md. Each building will be 18 x 100 feet, constructed of brick, with stone and terra-cotta finish. The ground floors will be used as stores and the upper floors as dwellings. The cost will be about $120,000.

MR. W. Z. PARTELLO is making some important improvements on the northwest corner of Sixth and P streets, Northwest, Washington, D. C. The ground in question has a frontage of 225 feet on P street and 95 feet on Sixth street. The old frame houses, five in number, have been torn down, and there are being erected on the site 14 brick dwellings. The new houses will be 18 x 30 feet in the main, with extensions of 14 x 26 feet. The fronts will be of pressed brick, with stone trimmings. Each building will contain eight rooms and will be heated by a furnace. The cost of the entire work is estimated at about $49,000.

EVANSTON, ILL., is putting up a brick schoolhouse, 65 x 70 feet in size, and three stories in hight. Each floor is to be arranged with a large study-room and small recitation-room opening from it. The building will be very thoroughly lighted and ventilated, and it is expected to be ready for occupancy about September 1. It is designed to cost, when completed, about $35 000. Mr. W. W. Boyington, of Chicago, Ill., is the architect under whose supervision the building is being erected.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

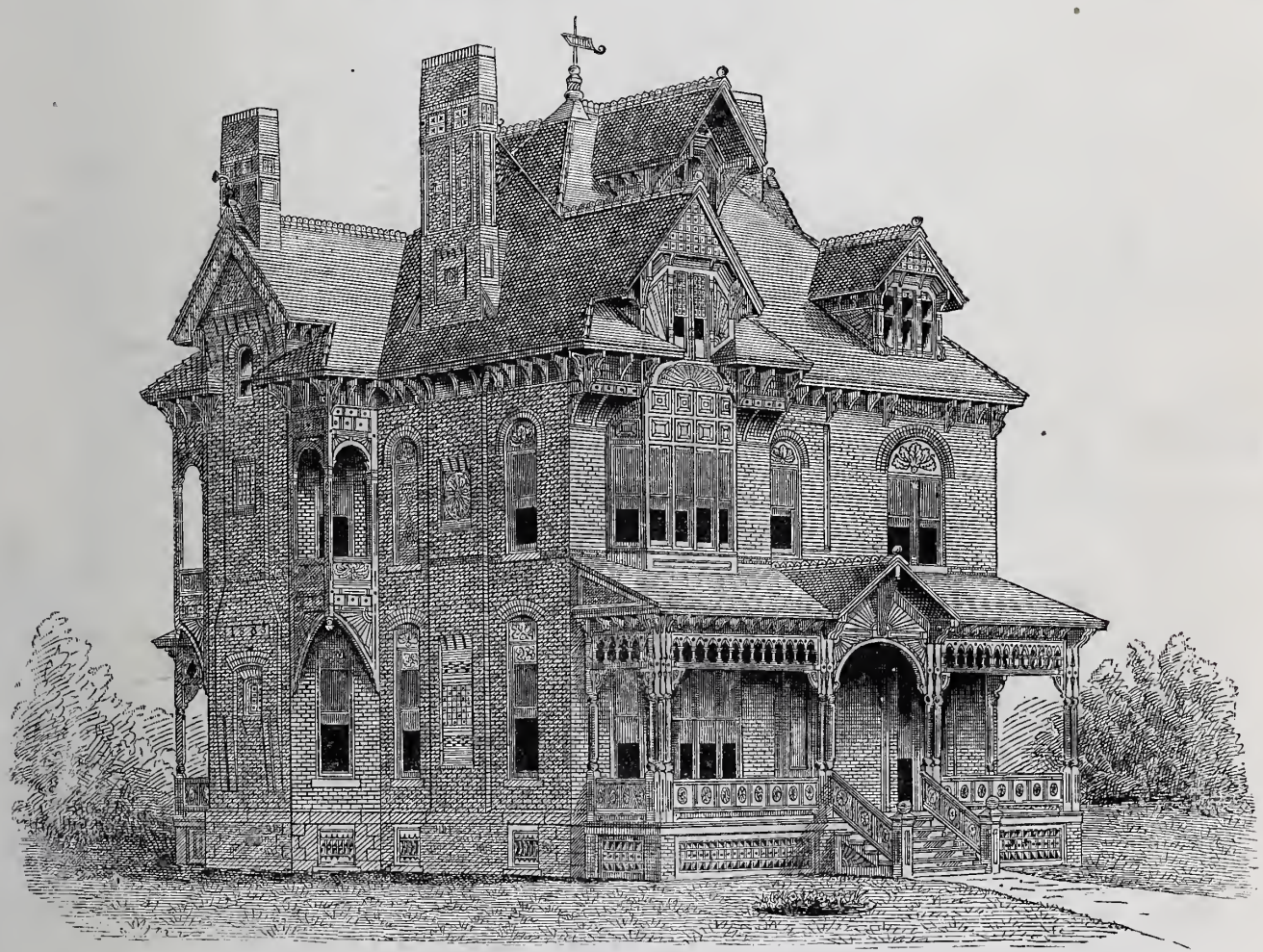
VOLUME V. NEW YORK=JUNE, 1883. NUMBER 6

## First Prize Design in Ninth Competition.

We take pleasure in presenting our readers this month with the perspective view, elevations, floor plans and a few selections from the details of the design of a brick house to which was awarded the first prize in the Ninth Competition. We expect to present the remainder of the details at another time, their elaborateness and quantity preventing our publishing them all at once, which we should be glad to do if space permitted. The author of this design, as has already been announced, is Mr. John R. Church, of Rochester, N. Y. We are indebted to him for notes upon which the following description of this design is based. The author disclaims any attempt to limit cost. He states that his endeavor has been to present a brick house according to the best state of the art. How well he has accomplished this our readers will be able to judge after they have inspected his work. Mr. Church says that the plan to which these elevations were required, being quite a liberal one, it seemed to him to demand liberal treatment for the building in all respects. He decided to use Philadelphia pressed brick, and based his designs in part upon the use of molded forms furnished by the Peerless Brick Company, of that city. The use of these molded brick has necessitated fine detail in the wood and other work, in order to make the whole harmonious. The body of the house is intended to be of pressed brick laid in black mortar. The roof, which is half pitch, and has been so designed in order to avoid all flat decks and to present a shape most serviceable for a severe climate, is intended to be covered with black slate. The roof being large and massive, the cornice has been designed large, heavily molded and bracketed, thus giving the roof the appearance of being well supported. The gables, dormers, chimneys and other features have been so disposed as to produce a very effective sky line. The roof crest and hip rolls are intended to be of red terra-cotta. It has been the intention of the designer to have the woodwork painted a dark green, with chamfers picked out in Indian red, and sunk portions picked out in black. The galvanized iron conductor pipe, and the heads to the same, he designed to be painted green of the same shade as the woodwork, with the reeded portions of the conductor pipe picked out in red, and the chamfer on straps to conductor pipe picked out in black. He has intended the brickwork to be oiled, using two coats composed of boiled linseed oil and turpentine in equal quantities. This would give a rich dark-red color, which would contrast well with the paint of the woodwork, the black slate of the roof and other features.

The two chimneys shown in the south elevation are corbeled out and decorated with molded brick and terra-cotta. The corbeling and arch in dining-room chimney produce a very fine effect. Projecting the chimney in this way breaks up the surface and adds largely to the general effect. All of the chimneys are carried well up, so as to secure a good draft. The parlor chimney being very high, is secured with a brace of wrought iron, which, in place of the ordinary simple rod, is made an ornamental feature. The north side of the building being straight without any projection, the brickwork has been corbeled out at the sides of the hall window in second story, forming a fine molded arch connecting the two sides. A gable has been placed over the same to break up the large surface of the roof which would otherwise have existed, with good effect.

A molded brick arch has been introduced on the gable of the north elevation. The brick of the three gables has been corbeled out and filled with terra-cotta blocks, producing a very rich appearance, which cannot be fully shown in drawings upon a flat surface. The cornice over the front bay is carried out square and in line with the bay. By means of the large cove and brackets a gable is formed over the same, with a double window supplying light to the attic room. The dormer window in the opposite side of the front breaks up the surface of the roof at that point, and also contributes light to the attic. The outlooks upon the east and west sides are made very pleasing features



*Perspective View of Brick House Receiving the First Prize in the Ninth Competition. John R. Church, Architect, Rochester, N. Y*

by hooding out the roofs over the balconies.

The dining-room bay is brought out square upon the exterior by the introduction of balconies, which are supported by large brackets, under the heels of which the brickwork has been corbeled out to form supports. A gable has been introduced over this bay, which makes a tie for the chimney and has a very pleasing appearance. Arches of molded brick and terra-cotta panels are used over all openings above the basement. A number of very effective terra-cotta panels have been introduced, and are so placed as to break up large plain wall surfaces and to add greatly to the general effect of the whole design. Molded brick has been freely used throughout to break up plain surfaces and to produce a play of light and shade. A string course of molded brick, which is placed at the level of the second-story window sills, divides the hight in the right place to produce the best effect. A rough brick wall is intended to be carried up back of the cornice to the plate, which is 5 feet above the attic floor, thus giving good room in the attic. The foundation stone showing above grade line has been intended to be of Medina brown-stone, a 10-inch course laid with lower edge even with grade, a 9-inch water table with a 3 x 3 wash and filled in between with squared stone laid random course. The roofs of the porches have been intended to be covered with tin laid standing seam and painted the color of the slate roof.

*First Prize Design, Ninth Competition.—Fig. 2.—Elevation of South Side.—Scale, ⅛ Inch to the Foot.*

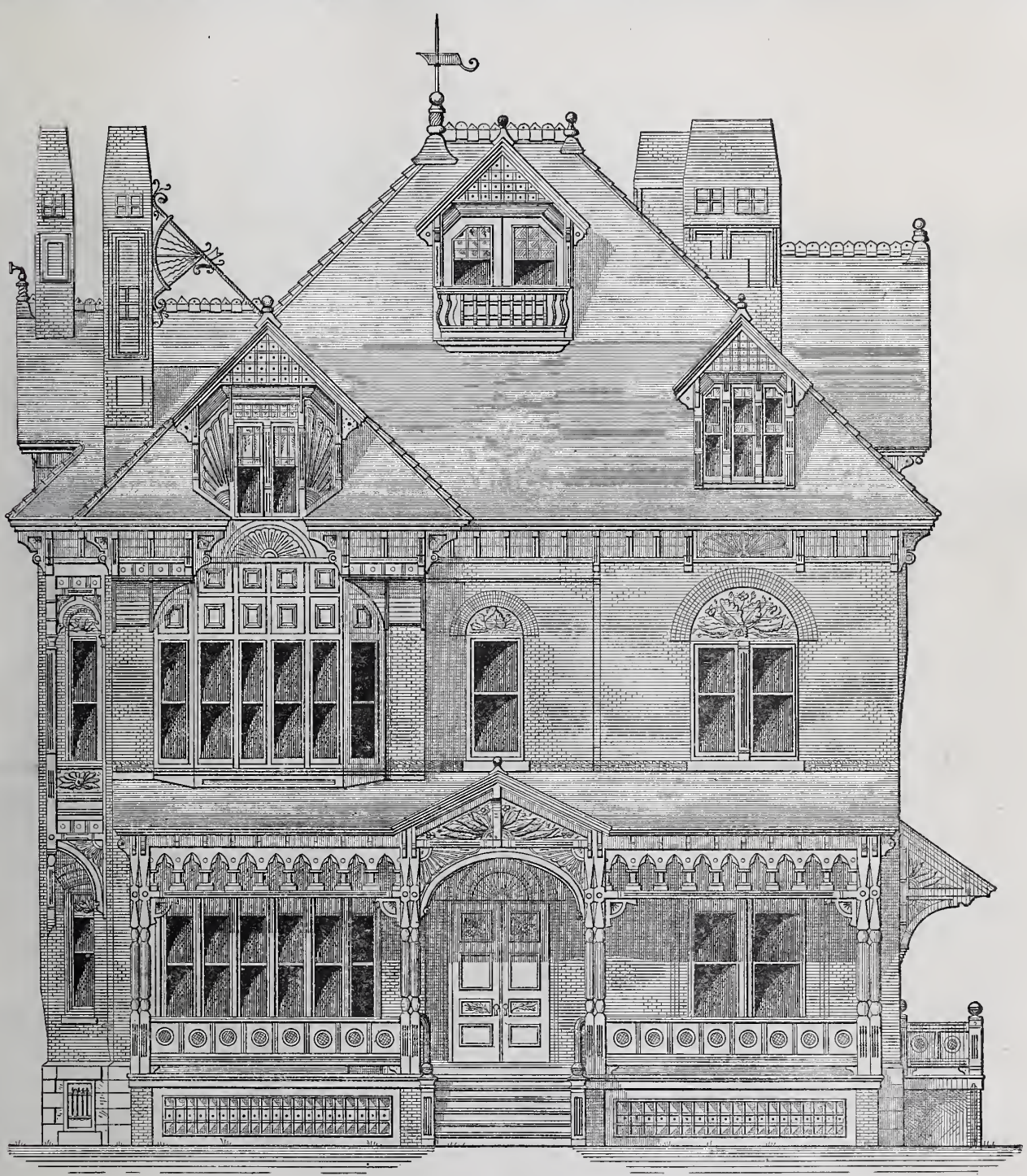
## The Condition of the Building Business.

According to the custom of former years, we shall endeavor upon this occasion to give our readers some general particulars concerning the condition of the building business throughout the country at the present time, together with the prospects for the season. The country, as is very generally known has enjoyed two years of marked prosperity in the building trades. Operations have been large during that time in almost every direction, and the number of men employed and the amount of building done in villages and farming sections has been almost as great, proportionately, as in the cities. The indications are that the present year will be equally prosperous. While there is less activity in some of the great business centers than was the case last year and the year before, the general average, taking the country from one extreme to the other, is quite as good at the present time as for the corresponding period in either of the seasons named. In one important respect the outlook at the present time is different from that of last year. Prospects in many sections of the country last spring were clouded by anticipated strikes and existing differences of opinion between employer and employed concerning wages. At present there seem to be no well-developed disputes of this kind, although clouds not larger than a man's hand appear above the horizon in one or two directions.

The information upon which we are basing our remarks, and upon which depend the facts and figures following, is derived from replies to circulars which we have sent to subscribers of *Carpentry and Building* in every town of 2000 inhabitants and upward throughout the country. From the mass of responses that we have received we have made tabulated statements for each State and Territory, so that as we write we have before us a map, as it were, showing in a graphic manner the opinions of our correspondents upon the points about which we have inquired. We asked the rate of wages per day for stonemasons, bricklayers, carpenters, painters and plasterers, with reference to what was paid last year, the rates current at present, and how they are likely to rule for the remainder of the season, in each of the trades named. With reference to employment, we inquired what proportion of the mechanics in the building

trades in the several places were employed last year, what number are at present fully employed, and what proportion, in the opinion of our correspondents, will have steady employment throughout the season. We also inquired about new business, as to the character of the work upon which mechanics are at present engaged, the prospects of new work during the season, and how this outlook compares with that of a year since. Lastly, we asked what causes have led to the general condition of affairs that our correspondents report. The responses have come in voluminously, and, in addition to the formal answers to questions, many of our subscribers have written us letters giving many interesting particulars for which no provision was made in the blank report we sent them. In an article like this, necessarily restricted in its length, we can do but scanty justice to the vast array of facts and figures before us, much less acknowledge in detail the many pleasant letters which it has been our fortune to peruse in this connection on what are all-absorbing topics to our readers generally.

We will commence with the extreme eastern portion of the country and travel as rapidly over the several States and Territories as we can, and mention the most prominent facts reported by our correspondents. Throughout the 58 towns in Maine to which we addressed our circulars of inquiry, we learn that wages are much the same as they were last year; that mechanics are fully employed in all but two of the towns reported, and that the prospects of new work for the remainder of the season are fair in almost all the localities. Several towns report greater activity than last year. Much the same condition prevails in New Hampshire, although two out of the 25 towns in that State report that less work is in prospect for the present season than existed a year ago at this time. Of the 34 towns in Vermont less work is reported to be in prospect in Montpelier than a year ago, while in all other places from which we have reports about the same or even more work is anticipated for the remainder of the season than existed last year. Wages in both Vermont and New Hampshire remain the same as last year. Our report is very complete from the Old Bay State. Of the 150 towns in Massachusetts, all report wages as likely to rule the same as last year, with the exception of Haverhill and Hudson, in which a slight advance is considered probable. The rates in these two towns as at present reported are fully up to the average of the State. The rates named for Boston are $3.25 to $3.50 for stonemasons, $3 to $3.25 for bricklayers, $2.50 for carpenters and painters, and $3.25 for plasterers. Five towns only in that great commonwealth report less work in prospect at the present time than a year ago. These, it may be remarked, are comparatively unimportant places, all the rest indicating fully as much business in store as existed last season. Of the 21 towns in Rhode Island, most of them report about the same amount of business this year as a year ago, while some say there will be more, and only a few less. Wages throughout the State rule about the same as a year ago, the large towns paying close up to the prices named for Boston above. Connecticut seems to be less favored than the other Eastern States to which we have referred. Out of the 69 towns, 10 report much less building in prospect now than a year ago, while a large number of our correspondents venture no opinion whatever. A few have said there would be more, while others content them-



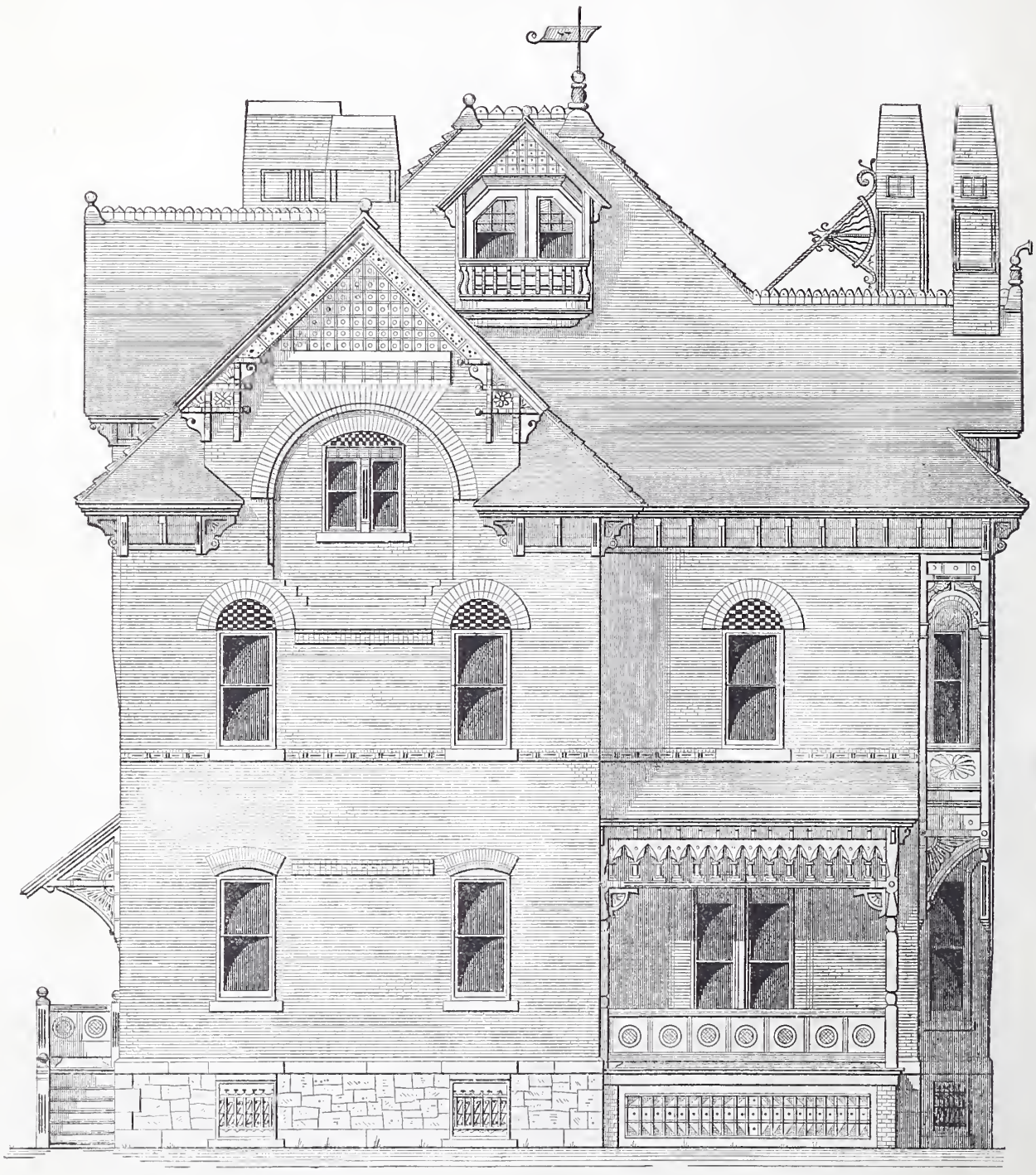
*First Prize Design, Ninth Competition.—Fig. 3.—Front Elevation (East).—Scale, ⅛ Inch to the Foot.*

selves by saying that there will be about the same. Mechanics in the building trades are at present fully employed. Wages rule about the same as a year since.

General activity and a continuance of the prosperity of the past two years characterize the 144 towns in New York State. Wages are reported higher in several places, while mechanics are fully employed in a majority of them. A very small number of unimportant places report less work in prospect now than a year ago, the vast majority of the towns anticipating a larger trade than last season. In New York City the building business is probably quite as active at the present time as for the corresponding period in either of the last two years. Not so much is being said about it at the present time as two years ago, because people generally, and the newspapers particularly, have become accustomed to the large operations which are proceeding in all directions. Wages are among the highest paid anywhere in the country, and rates are firmly maintained. Some of the large building projects which at the time of our report last year were temporarily suspended on account of labor difficulties have been resumed, and either have been completed or are being actively pushed at the present time. Other large operations are almost daily reported. While wages rule high in the great city, the increased cost of living and the lack of family comforts which the crowded condition of the metropolis causes gives the city workman quite as little to show for his labor as the man taking smaller wages in some of the interior towns. The prospects are good throughout the 54 towns of New Jersey, with the exception of Long Branch, which is conspicuous in reporting poor prospects.

In most parts of the Keystone State the building business is in a healthy condition. Our correspondent in Pittsburgh quotes stonemasons, $3.25; bricklayers, $4; carpenters, $2.75; painters, $3.25, and plasterers, $3. He also says that an advance on these rates is probable. Very few towns throughout that State report less than the full number of mechanics employed, and only seven towns report less business in view than a year ago. Among these may be mentioned Titusville, in the oil region, in which the outlook is said to be poor. Our correspondent there reports about two-thirds of the mechanics as likely to have steady employment through the remainder of the season. Delaware is up to the general average. Nearly all her mechanics are employed; the general outlook is fair, and wages rule about as last year. The same may be said of the District of Columbia, although in Washington City more work is anticipated than was done in 1882.

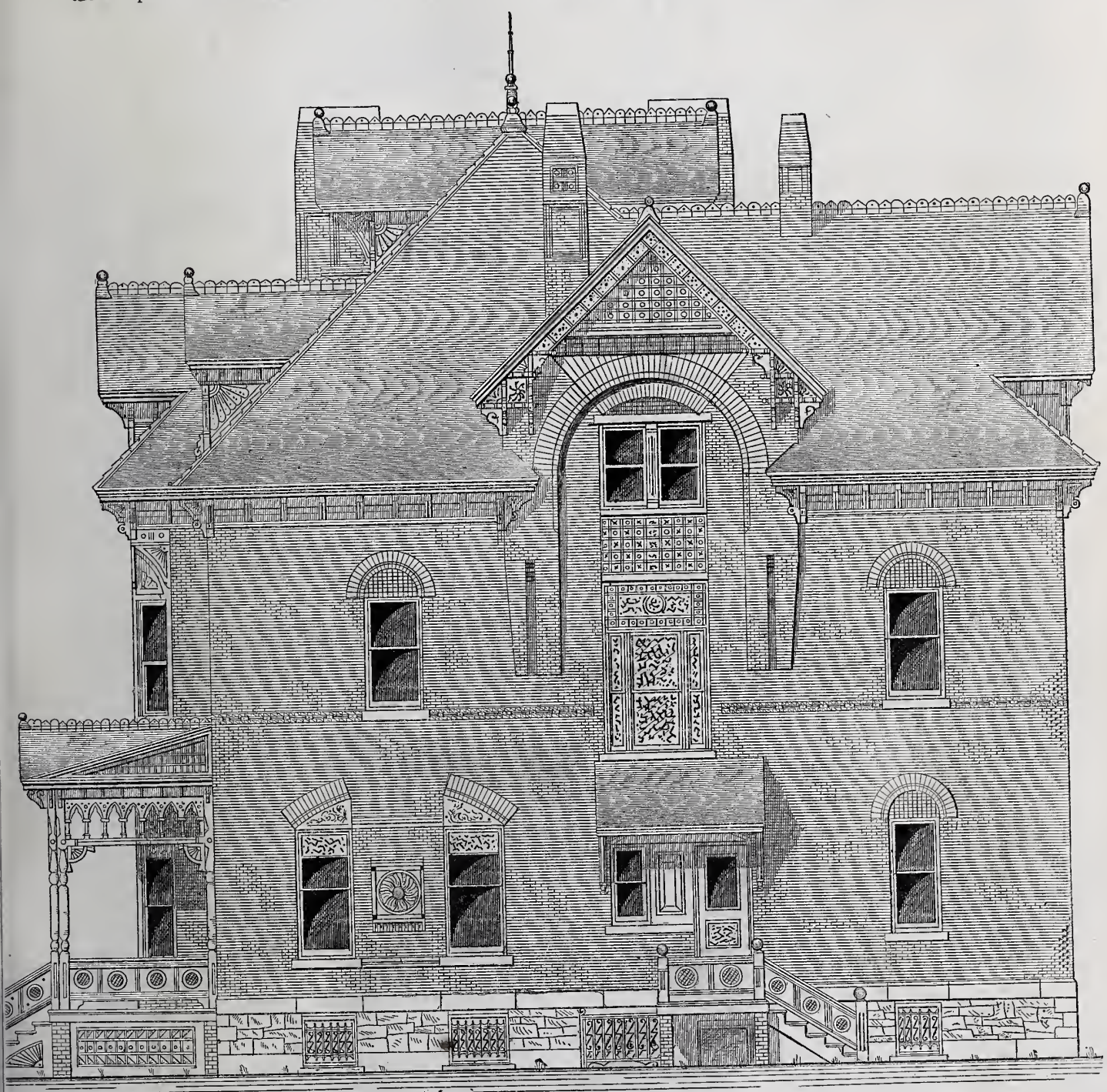
The Southern States, taken together, present a less cheerful outlook than some of those to which we have just directed attention. Of the 15 towns in Maryland, none anticipate a change of wages during the season. The rates named are from 20 to 33⅓ per cent. less than those ruling in the Central States. Nearly all her mechanics are employed, although less work in some of the towns is reported in prospect than would seem to be required to keep all busy. In Virginia the same condition of affairs exists. With the exception of Richmond, Norfolk and Hampton, wages are quite as low as those last mentioned. A slight advance is anticipated in one or two of the towns in which rates at the present time are very low. Nearly all mechanics are at present employed, with fair prospects in most of the towns reported. North Carolina seems to be enjoying a fair degree of prosperity. Higher wages are anticipated in Wilmington, which are at present reported below the average of other points of similar importance. South Carolina anticipates more building than last year in each of the 12 towns to which we addressed inquiries, with the exception of one.



*First Prize Design, Ninth Competition.—Fig. 4.—Rear Elevation (West).—Scale, ⅛ Inch to the Foot.*

Wages will rule about the samo as last year, and at present a large majority of the mechanics are fully employed. Of the 20 towns in Georgia, all report wages as likely to rule throughout the season about as at present. The rates named by our correspondents throughout that State are somewhat higher than those in the other Southern States, although they average less than those paid throughout the Middle and Western States. Seven towns in Florida report a comfortable condition in the building trades. Mechanics are generally employed, and, with the exception of St. Augustine and Cedar Keys, wages are expected to remain about as last year. These two places are at present paying about the same figures. St. Augustine anticipates higher rates, while Cedar Keys expects to pay less. The outlook in Alabama is less cheerful than in the other Southern States. Our correspondents state, in many of the 16 towns to which we addressed inquiries, that trade is likely to be dull for several months to come. Wages in many cases are not established, but are arranged by negotiation when jobs are undertaken. The condition of affairs in Mississippi is a little more satisfactory. A lower tendency in wages is reported from Corinth, while other towns expect to pay about the same as last year. Mechanics at present are very generally employed. In Louisiana more work is anticipated in every town from which we have heard than was done last year. Wages in New Orleans are higher than in other towns in the State, and are nearly up to the general average paid in the larger cities. Our reports from 37 towns in Texas indicate that the Lone Star State is not being left behind in the race of material prosperiiy. General activity is reported in all directions, and an advance of wages is anticipated in both Austin and Dallas. Rates are relatively high throughout the State, and in general are expected to rule for the season about the same as at present. Arkansas would seem to be at a standstill. Hot Springs is the only town in which there appears to be an anticipation of an advance in rates. Our correspondent from that point does not seem to give a good reason for his expectations in this direction, as he reports many men idle at the present time. Pine Bluff anticipates a larger business than was done last year.

In the great Central Western States the mechanics in the building trades seem to have a fair prospect for full employment throughout the season, with wages about the same as ruled at the close of last year. Of the 105 towns in Ohio, five report an upward tendency in rates, while only one indicates a dropping off. Our correspondents unite in the opinion that nearly all the mechanics in the building trades will have employment throughout the season. Rates in Cincinnati are considerably above the average for the State, being $4 for stonemasons, $5 for bricklayers, $2.75 for carpenters, $2.50 for painters and $4 for plasterers. The general average throughout the State for carpenters is from $2.25 to $2.75 per day. Among the 61 towns in Indiana the same general conditions prevail. Rates in Indianapolis are about equal to the general average of the State. Several towns report a probability of higher wages before the season is over, although the rates named as ruling at the present time are fully up to those of the section of which Indiana is a part. Mechanics are very generally employed throughout the State at the present time, and prospects of work for the remainder of the season are good. Among the 101 towns in Illinois to which we applied for information, the conditions are very much the same as those just reported for Indiana and Ohio. Mechanics at present are very generally employed. Wages rule firm, with an upward tendency in a few cases, and the prospects for work are very good. Building operations in Chi-



*First Prize Design, Ninth Competition.—Fig. 5.—Elevation of North Side.—Scale, ⅛ Inch to the Foot.*

cago have been embarassed by a strike. Mechanics from the surrounding country, however, have gone to that city in such numbers that the difficulty is about removed.

Among the towns of West Virginia it would seem, from the reports we have reeived, that mechanics are generally employed. Wages rule up to the average, and there is plenty of work in prospect. Of the 27 towns in Kentucky it is reported that the same rates are likely to prevail for the balance of the season as are now paid. Mechanics are fully employed, and there is an abundance of work in prospect. In Tennessee the same conditions exist. Memphis is paying higher rates than the smaller towns, and anticipates continuing wages at about the present standard throughout the season. In most of the places in that State from which we have heard the prospects for a continuous business throughout the season are good.

The building trades are prosperous in the Peninsular State. Of the 74 town in Michigan very few report less work in prospect than was done last year. A few anticipate a slight advance in wages, and all of them report mechanics well employed at the present time. The building trades in Wisconsin are fairly active, with good prospects for the season. Milwaukee pays lower rates than some of the smaller places, and reports about 90 per cent. of her mechanics fully employed. Most of the towns anticipate fully as much trade this year as last. The same general conditions prevail in Iowa. Rates in some parts of that State rule higher than in those immediately east and south of it. Slight advances are anticipated in some directions. Nearly all mechanics are employed at the present time, and prospects generally are promising. Rates in the 40 towns in Missouri to which we addressed circulars are somewhat higher in their general average than those ruling in the Central Western States. St. Louis, on the other hand, reports lower figures than some of the smaller towns in the State. The rates named for that city are as follows: Stonemasons, $3.50; bricklayers, $3.25; carpenters, $2.75; painters, $2.50, and plasterers, $3.50. Our correspondent reports nearly all at present employed, and thinks rates will rule the same during the balance of the season.

Of the 21 towns in Minnesota very few report less work in prospect than was done last year. The majority of them anticipate an increase of business. Wages rule about the same as the general average of the section of which Minnesota is a part, and are likely to remain the same during the season. From Kansas our reports are somewhat conflicting. Some of the towns anticipate a larger business, while others will do less. Wages will probably remain at about present rates, which are perhaps 10 per cent. under those of neighboring States. Mechanics at present are very generally employed. In Nebraska the outlook is not the most favorable. While mechanics are fully employed, less work is reported in prospect from more than half of the towns from which we have heard than was done last year.

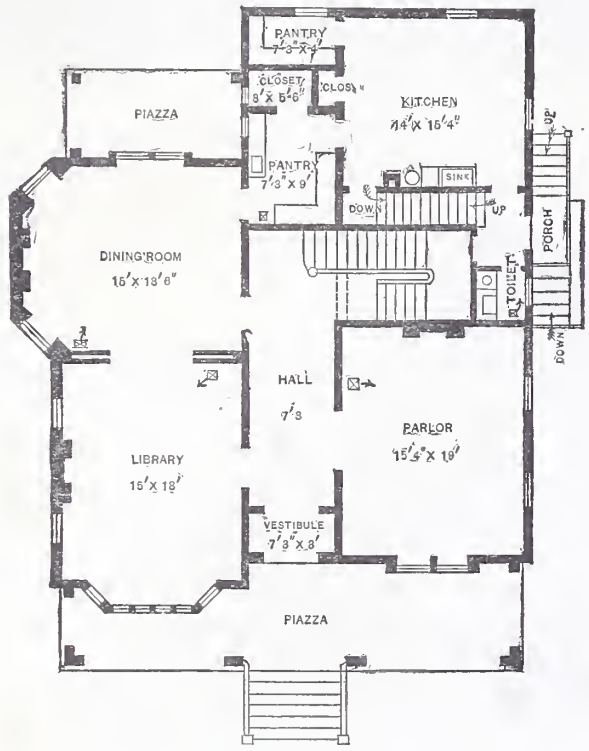



Fig. 6.—First Floor Plan.

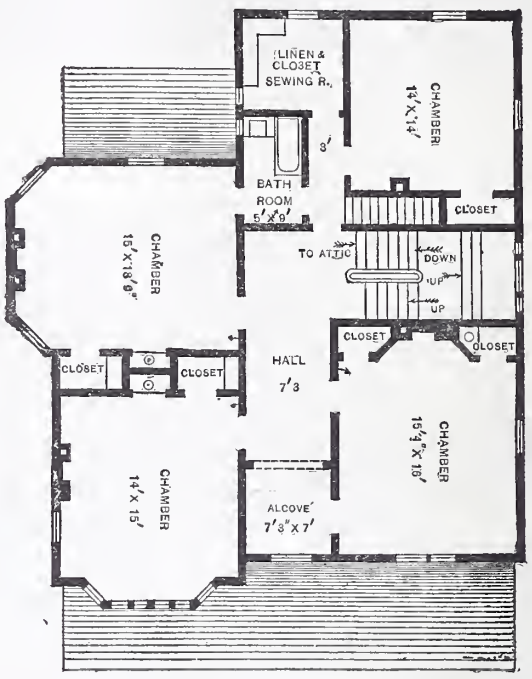



Fig. 7.—Second Floor Plan.

*Floor Plans in the Ninth Competition.—Scale, 1-16th Inch to the Foot.*

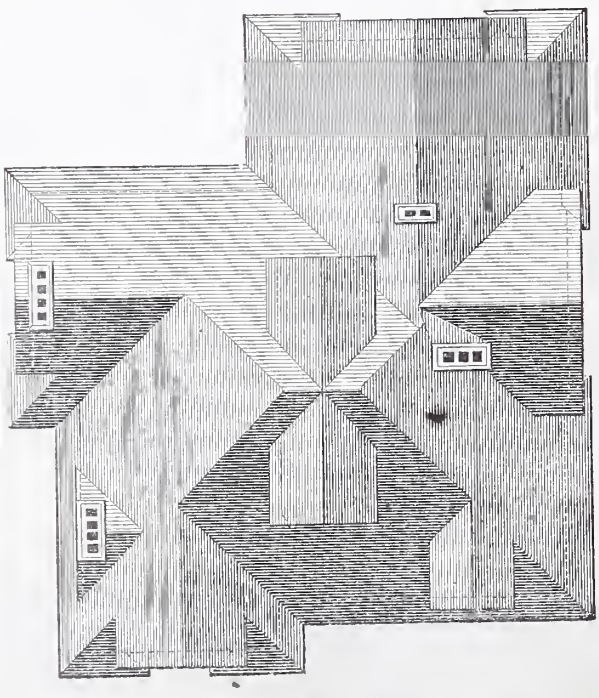


*Fig. 8.—Roof Plan Accompanying Elevations Shown in the Preceding Pages.—Scale, 1-16th Inch to the Foot.*

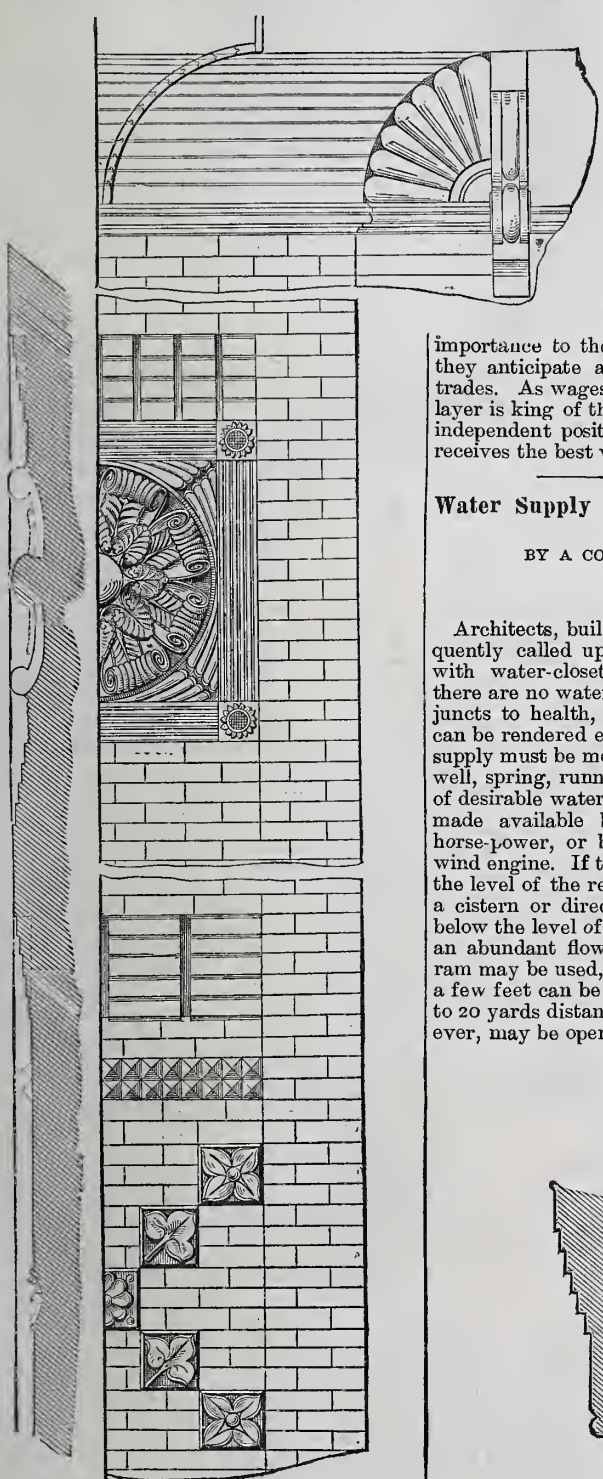
In the Territories occupying the central belt west of the Mississippi, wages, of course, rule at rates far above those paid in other communities. Ogden City, Utah, for example, reports stonemasons, $4; bricklayers, $4; carpenters, $3.50; painters, $2.75; plasterers, $3.50, with an upward tendency. Mechanics throughout that Territory seem to be fully employed at the present time, and, with the exception of Salt Lake City, all the towns from which we have heard report more work in prospect than a year ago. In Montana Territory wages are nearly 50 per cent. higher than those last quoted. Our correspondents, however, anticipate lower rates for the future. Mechanics are not very fully employed at the present time, and less work is in prospect than last year. In New Mexico about the same rates prevail, and trade is probably a little better than in the Territory last mentioned, although our correspondents are not very sanguine. In Dakota rates are not quite so high, and trade is reported better. In the State of Colorado rates are somewhat less than those ruling in the Territories, although very considerably above those of some of the other States. One town out of the 16 in that State anticipates higher rates, while 4 report less work in prospect than was done a year ago. At present about three-fourths of the mechanics are fully employed.

Our replies from the States on the Pacific coast are unusually complete. Wages in California rule from 25 to 33⅓ per cent. higher than the general average throughout Ohio, Indiana and Illinois. Our correspondents anticipate that nearly all mechanics in the building trades will have steady employment through the season. Of the 30 towns containing 2000 inhabitants and upward in that State, two report less work in anticipation than was finished last year. The others, for the most part, anticipate a larger trade.

The rates paid at Portland, Oregon, are reported as follows: Stonemasons, from $5 to $7; bricklayers, from $5 to $5.50; carpenters, $3.50 to $4; painters, $3, and plasterers, $4.50. Our correspondent anticipates even higher rates than these before the season is over. A large trade is in prospect,

and every mechanic is at present employed.

Our readers will perceive that this report of the building trades at the present time is somewhat monotonous in its terms. Mechanics are very generally employed at wages that are presumably satisfactory to both employer and employee. The character of the improvements being made varies from



*First Prize Design, Ninth Competition.—Fig. 9.—Panels in Library Chimney, &c.—Scale, ½ Inch to Ft. Corner Pieces, Upper Panel, No. 265 Peerless Brick Co. Border, No. 277. Center, Terra Cotta. Square Pyramidal Blocks Lower Down, No. 32.*

repairs of old buildings and erection of new ones of moderate cost to elaborate structures for both private and public purposes. The building trades are at present perhaps more quiet in all respects than they have been before in several years past. Less talking is being done, less public notice is being directed to them and more solid work is being performed than in past seasons. Such a condition of affairs cannot be otherwise than healthy, and the building trades gen erally are to be congratulated that they exist. There are no special lessons to be derived from the situation as we have presented it. There are one or two facts, however, to which we may direct attention profitably. Of the five trades reported, painters, at the present time, are the poorest paid. Next in order come the carpenters, with rates scarcely any higher than those which the former receive. Following the carpenters come the plasterers, in many cases receiving about the same wages, although they average from 25 to 50 cents per day above them. Next in order are stonemasons, there being a material advance between plasterers and this class. Highest in the list come the bricklayers, with wages averaging 50 per cent., in many cases, above those paid carpenters. These facts cannot fail to be of importance to those who have boys whom they anticipate apprenticing in the building trades. As wages rule at present, the bricklayer is king of them all. He has the most independent position about a building and receives the best wages.

## Water Supply for Country Dwellings.

BY A COUNTRY PLUMBER.

I.

Architects, builders and plumbers are frequently called upon to provide residences with water-closets, bathrooms, &c., where there are no water works. Before these adjuncts to health, comfort and convenience can be rendered effective, this lack of water supply must be met. If there is an unfailing well, spring, running stream or other source of desirable water near at hand, it may be made available by pumping by hand or horse-power, or by steam, gas, hot-air or wind engine. If the spring is situated above the level of the residence it may be piped to a cistern or directly into the dwelling. If below the level of the residence, and there is an abundant flow at all seasons, a hydraulic ram may be used, provided a fall or head of a few feet can be obtained within a run of 8 to 20 yards distance. Hydraulic rams, however, may be operated by a coil drive-pipe, and this distance shortened. Small motors for pumping water are numerous, and many of them are especially adapted for use in private dwellings.

The utility of the wind engine, or windmill, as it is popularly called, is too well established to require discussion at this day. True, they are more effective in some parts of the country than in others. Nevertheless, they can be made available wherever the wind blows, and if any person resides where it does not blow, it is to be hoped that he either has no use for water or else has a Croton supply.

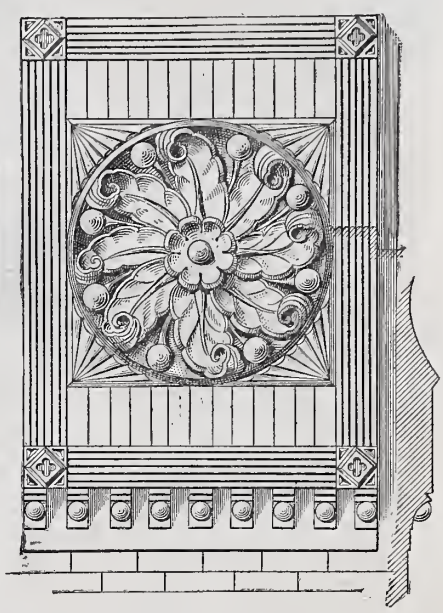


*Fig. 10.—Panel in First Story, North Side.—Scale, ½ Inch to the Foot. Corner Pieces, No. 204. Border, No. 275a. Center, Terra Cotta. Finish Along Lower Edge, No. 67.*

The average number of days during the year in which there is sufficient wind to move a windmill pump in any section of the United States is probably not known with much definiteness, although windmills have been used for this purpose for many years, and manufactured as an article of trade for about 30 years. The writer made a careful record in 1877 of the days in which there was not wind sufficient to operate a mill. During the entire 365 days there were 23 days that it failed to run, leaving 342 days in which it did more or less work at some time during daylight. No observation was made

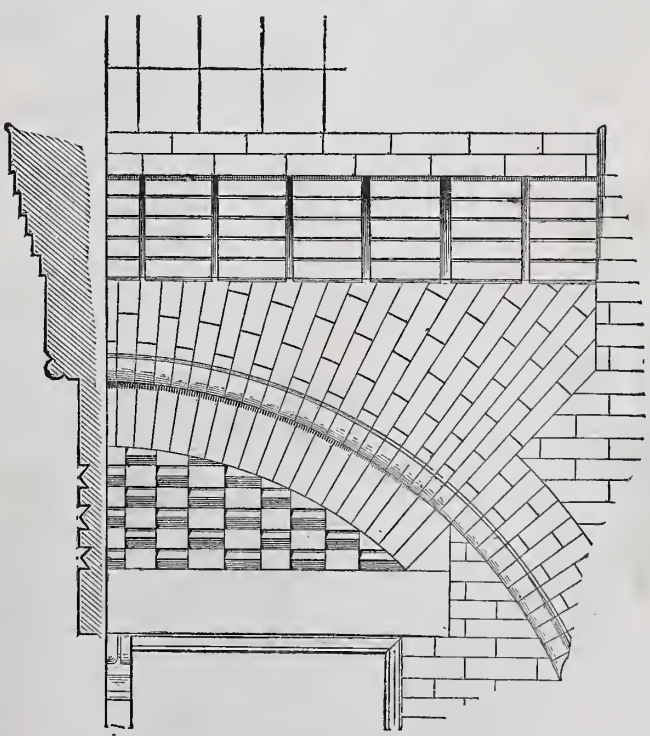
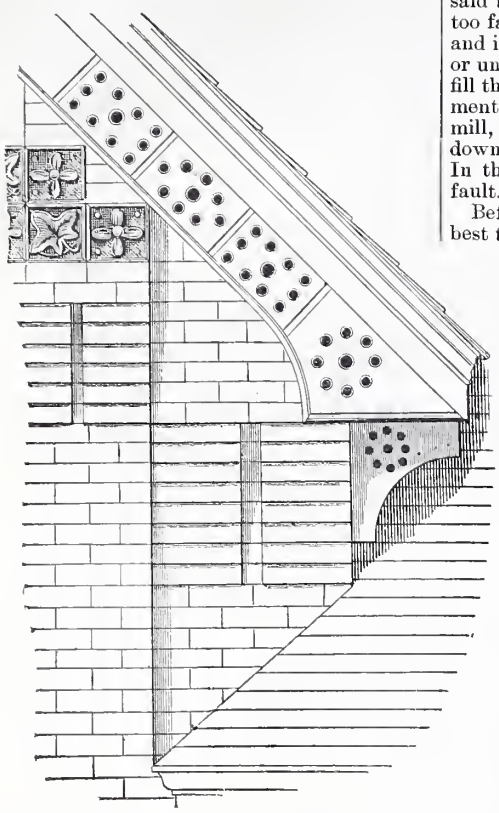


*Fig. 11.—One-Half of Gable in North and West Elevations.—Scale, ½ Inch to the Foot. Bead in Arch, No. 5. Filling of Tympanum, No. 25, with Ordinary Headers.*

at night. It is the exception for a windmill to run after night during the summer, at least in the central section of the country.



*First Prize Design, Ninth Competition.—Fig. 12.—Part of Gable on South Side.—Scale, ½ Inch to the Foot.*

Let me impress it upon the mind of the young mechanic and the inexperienced that he cannot too carefully consider just how and where the mill and pump and the tank or reservoir are to be situated. Ho may have to look from many standpoints before he can fully comprehend all and be enabled to make the most advantageous selection. Some possess a ready faculty of comprehending such subjects, while the minds of others move more slowly.

If possible, the windmill should be placed so that it will be well exposed and the pump so that it will do full duty. A neighbor of mine has a windmill erected near a lofty and and branching tree, which obstructs the

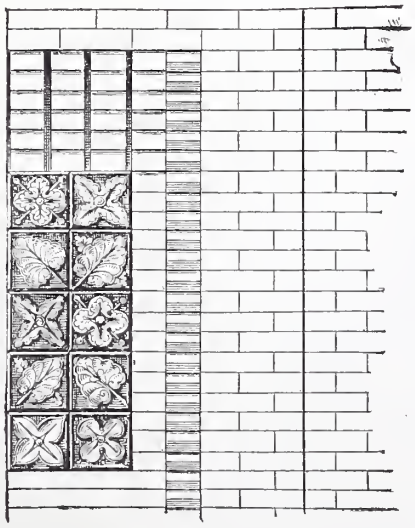


*Fig. 13.—Upper Panel in Dining Room Chimney.—Scale, ½ Inch to the Foot. Composed of Terra Cotta Blocks.*

mill in summer from that source from which the wind blows most frequently. He is opposed to destroying or mutilating the tree, so the mill is often idle. Had the mill been erected a few yards to either side, it would have rendered much better service and shortened the lines of connecting pipes. The situation was not well considered. I recently examined a mill and pump that was said to be doiug poorly. It had been erected too far away and above the water supply, and in consequence the pump was starved, or unable to draw water rapidly enough to fill the cylinder. Several expensive experiments were made, but without success. The mill, tower and pump have since been taken down and removed to a better situation. In this case somebody's judgment was at fault.

Before selecting a mill and pump it will be best to ascertain to what elevation and distance the water must be conveyed and the probable quantity required. It is to be presumed that the owner of the premises has satisfied himself as to the purity and suitableness of the water, and that we are called upon to perform the mechanical and engneering work ouly. First, then, we shall look for a site for the storage cistern or tank, which must neccessarily be above the level of the highest tap in the dwelling. If there is au elevation or hill on the premises, it will probably be best to construct a cistern in or upon it. Any form or kind of cistern will answer our purpose if actually tight and frost-proof, although it will probably be best and cheapest to construct it of brick, and cement it inside. The water will be better stored in such a cistern thau iu either wood or iron. A head of 5 to 10 feet on the highest taps will probably be sufficient, and to locate the cistern unnecessarily high will increase the labor of pumping; hence it is well to locatethe reservoir as low as circumstances will practically admit. No mistakes must be made, however, aud if the hill is far away a very careful survey must be made to ascertain the elevations. Taking the elevation or vertical distance to source of supply will uot require the services of an engiueer, as we need only to approximate it. Any correct level that can be conveniently obtained will serve as an instrument, and any intelligent mechanic should be competent to find the elevation with reasonable exactness. There are many premises where an underground cistern cannot be constructed at a sufficient elevation. In such

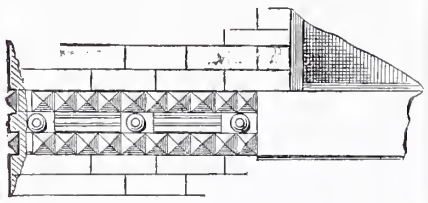


*Fig. 14.—String Course Between Stories.—Scale, ½ Inch to the Foot. Composed of Nos. 10, 32 and 62a.*

cases a tank of some sort must be substituted, which may be placed in the attic of the dwelling or elevated in the mill tower, and thus save the cost of a special structure to carry it. Few dwellings are sufficiently strong to bear up safely the weight of 1000 to 5000 gallons of water, nor is it always desirable to place a water-tank iu the attic of a dwelling.

Fig. 1 shows the method of constructing a mill tower with tank elevated within it haviug a capacity of about 2000gallons. Timbers 8 inches square are used for sills; 2 x 6, 2 x 8 and 6 x 6 inch for corners; 2 x 8 and 2 x 6 inch for braces. The 2 x 6 and 2 x 8 inch are spiked on the outside of the 6 x 6 inch, forming solid 8 x 8 inch corners up the 6 x 10 inch cross sills, upon which the tank joists rest. The tower stands on four stone piers and is firmly anchored to them by inch rods secured at top by cast-iron lugs bolted to the corners and running down through the stone piers, with iron plates and nuts beneath. Au 8 x 8 iuch mast is shown framed in the top and resting on bottom of tank for a 10-foot mill, but any size mill to 14 feet diameter of wind-wheel may be used by framing in suitable masts. The tower may be inclosed after tank is iu position in any style to suit.

Fig. 3 of the illustrations shows its appearance when finished as indicated. The sectional drawing, Fig. 1, shows the manner of framing the roof, the tank joists, the braces, and for a floor in second story. This tower may be erected directly over a well, as shown in cut, or near to a spring, the pump being located in a frost-proof pit beneath. The illustration shows a pump arranged to automatically stop the mill when the tank is filled. A bracket stuffing-box, *a*, is bolted to a plank, *b*, secured in the well or pit, the connecting-rod *c* to windmill working through a pipe flanged to bottom of tank, shown at *d*, and reaching above high-water line. The pump cylinder *e* may be placed directly beneath the stuffing-box if in a pit, or any distance below if in a well. The discharge pipe *p* is also shown flanged to the bottom of tank, an air chamber, *f*, being placed in the discharge pipe near the stuffing-box, with a union between them, so that

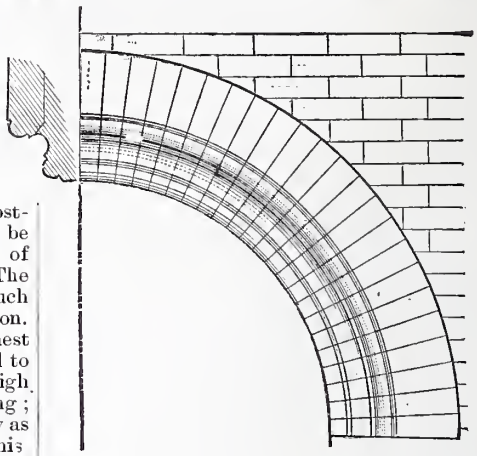
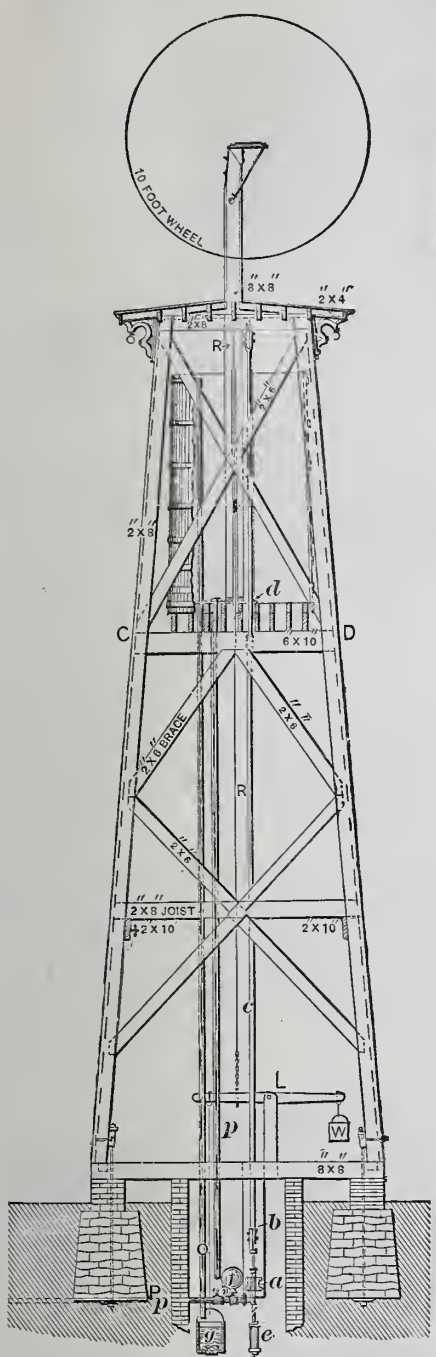


*Fig. 15.—Arch Finishing Front Door Opening.—Scale, ½ Inch to the Foot. Composed of Nos. 15a and 15b.*

the pump may be disconnected in the event of needed repairs, and a check-valve, *v*, between the air chamber and where the distributing pipe P *p* brauches from pipe leading to the tank, which will hold the water back from the air chamber and pump when being emptied or repaired. Sometimes a stop-cock or straightway valve is also placed just above the check-valve, and is useful in case the check-valve fails to hold or needs atteution. The distributing pipe P *p* passes through the wall of the well or pit, and is continued below frost line. At *g* is a regulating box for stopping the mill, which cperates as follows: When the tauk is full the water overflows through the overflow pipe O O (which is also flanged into bottom of tank aud rises to near the top) and discharges into the regulating box, which should hold about five gallons, and its weight when full pulling down on the lever L attached to shut-off rod, R, will furl the sails and stop the mill. In the bottom of this box is bored an inch hole, and on the under side and over this hole is tacked a thin piece of sheet brass or zinc, with a very small hole punched through it—so small as to require several hours for all the water to leak out. Iuside the box, over the hole, there is placed a fine brass cloth, to prevent the hole being stopped. The weight W must be heavy enough to raise the box *g* when empty, and to permit the mill sails to spread to the wind. The mill will then resume pumping, replacing water consumed during the time it was standing, A ¾-inch pipe is also flanged to the bottom of tank, reaching above high-water line, for the shut-off rod R to work through. The lever L may, however, be placed above the tank and the regulating box, suspeuded from it by a strong wire passing down outside the tauk.

The tank aud pipes may be protected from freezing as follows: Ceil under the joists upon which the tank rests with matched boards, aud pack in between them and arouud the bottom of tank with sawdust. Cover over the tank and spread sawdust on top about six inches deep. Iuclose the two pipes from bottom of tank to, say, 2 feet below the deck, covering the well or pit with a box just large enough to contain them. Outside of this coustruct another box, from

bottom of tank to deck, 2 to 4 feet square, according to location, filling in between with sawdust, which should be dry. If pipes are




*Water Supply for Country Dwellings.—Fig. 1.—Section Showing Construction of Tower, Carrying Windmill and Tank.*

first wrapped with two or three plies of rosin-sized paper or felt, and again with one or two plies of hair felt, these being separated with paper felt and covered over with

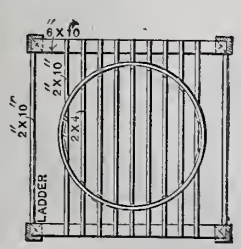



*Fig. 2.—Section on C D of Fig. 1.*

the same, finishing with felt and canvas, the inner box may be omitted and the outer one made smaller or left off entirely, according to climate. In those States south of the 40th parallel the sawdust may be omitted beneath and over the tank. Further north greater protection is of course required. Hair felt and mineral wool are most excellent non-conductors of heat, and are cheap and easily applied. They have the further advantage that vermin don't disturb them, while they make a much neater and safer job than boxing and packing with sawdust. Beneath the tank place a metal safe or drip-pan to catch any water that may leak from tank, which will keep the timbers and packings dry. Frequently on inexpensive jobs this is omitted.

Fig. 4 shows a similar arrangement of tank in mill tower, but much larger, being about 9 feet diameter by about 13 feet deep and capable of holding about 5500 gallons. The pump and pipes may be arranged as shown in Fig. 1. The tower is shown resting on a stone foundation, to which it is anchored, as in the former case. The sills and corners are 8 x 8 inch timbers; 2 x 10 inch and 8 x 12 inch for girts, and 4 x 6 inch for braces, held in position by ¾ inch girt rods. The two 8 x 12 inch girts also act as sills for the 3 x 12 inch joist, on which the tank rests. As in Fig. 1, the tank is set a little to one side, to give room for ladder. Such a tower is capable of carrying any size mill up to 18 or 20 feet diameter. This tower may be inclosed and finished in any desirable style. The arrange-

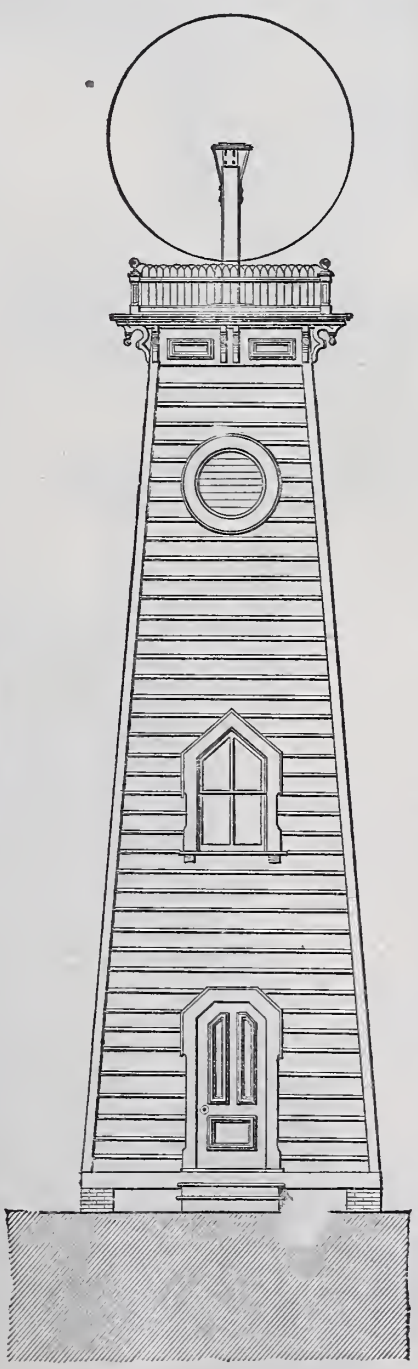


*Fig. 3.—Outward Appearance of Tower Finished.*

ment of pump is very simple. The illustration shows one of the U. S Wind Engine and Pump Co.'s Union top force pumps, P, bolted to a plank secured in pump pit and attached to the windmill by reciprocating rod, B, passing through pipe, A, flanged to the bottom of tank. The suction pipe S leads to a spring or other source of supply. It may descend to water in well. An air or vacuum chamber, V, is placed on same, just below the pump, to insure a regular and full supply of water to pump. If suction is very short and lift only a few feet, this may be omitted; otherwise it is indispensable. The discharge pipe D and conveying pipe C are one, and joined to pump by a union and nipple. A is air chamber

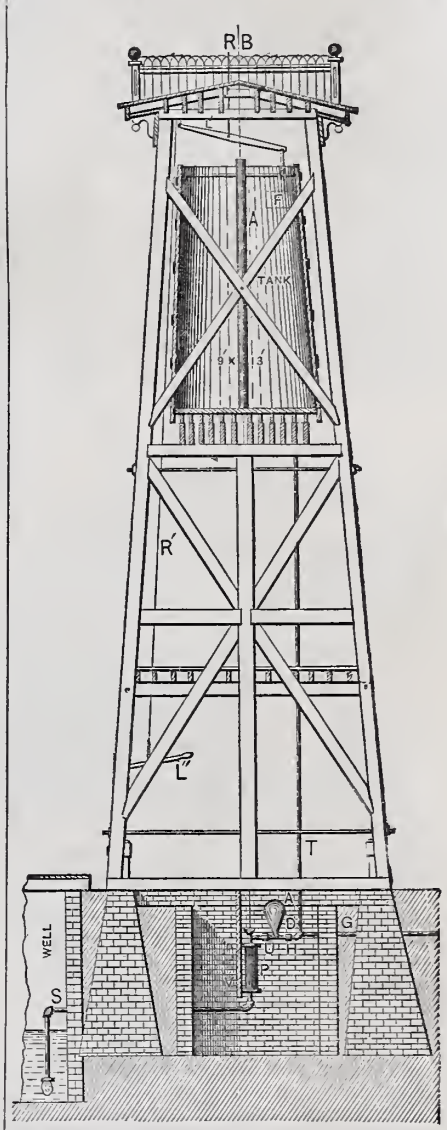



*Fig. 4.—Another Construction, Showing a Larger Tank in Tower.*

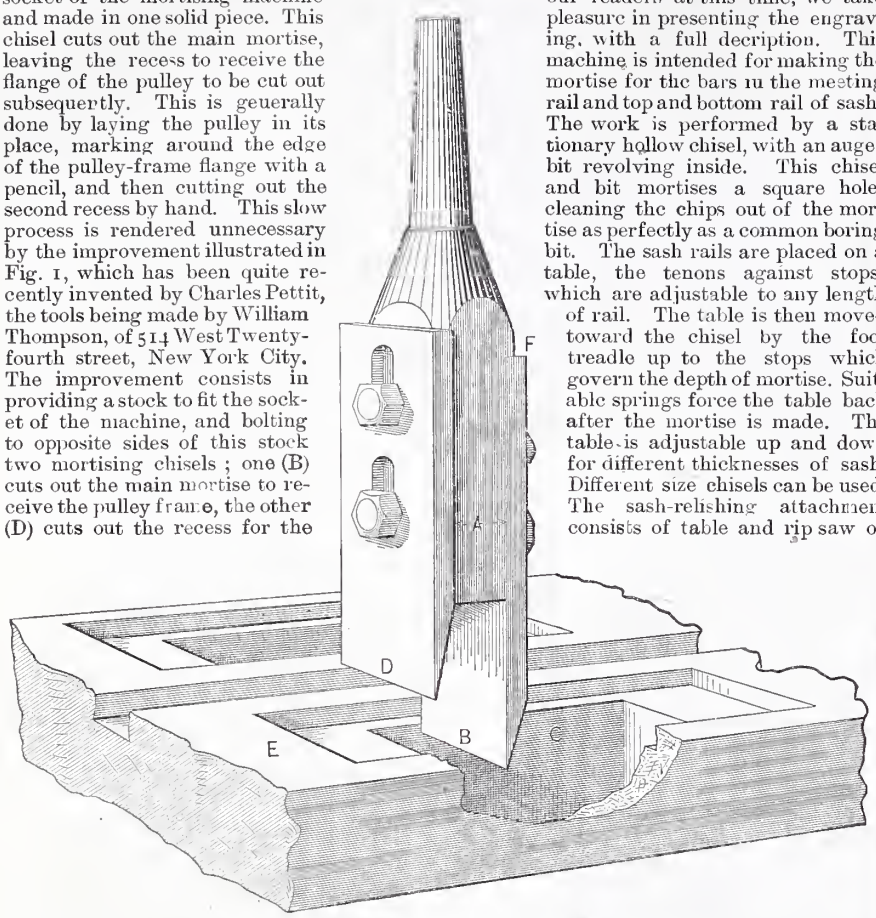
and H horizontal check-valve on same. It will be observed that the tank pipe T rises directly through the tower to bottom of tank, to which it is flanged. No overflow pipe is shown. This may be put on as already described, or be connected to tank near the top and brought down outside of tank inside of tower and discharge into a drain. As there is a simple and excellent arrangement to stop the mill when tank is full, an overflow pipe is needed only as a precaution. The automatic stop operates as follows: A float, F, made of sheet metal—copper is best—is connected to one end of the lever L, the buoyancy being sufficient when tank fills to pull down the shut-off rod R, attached to opposite end of the lever, and stop the mill. At E is shown a hand lever connected to the lever over the tank for stopping the mill at any time.

If for any reason the mill tower must be erected on a much lower plane than the dwelling, and a cistern or tank cannot be placed in hill-side or attic, a special structure should be erected, which may be placed wherever most convenient and not mar the beauty of the premises. The plans for tanks in tower can be readily adapted for such use by slight modification.

## NOVELTIES.

### A New Wood-Working Tool.

The tool ordinarily used to cut out the mortises to receive the pulleys for sash frames is a single mortising chisel fitting the socket of the mortising machine and made in one solid piece. This chisel cuts out the main mortise, leaving the recess to receive the flange of the pulley to be cut out subsequently. This is generally done by laying the pulley in its place, marking around the edge of the pulley-frame flange with a pencil, and then cutting out the second recess by hand. This slow process is rendered unnecessary by the improvement illustrated in Fig. 1, which has been quite recently invented by Charles Pettit, the tools being made by William Thompson, of 514 West Twenty-fourth street, New York City. The improvement consists in providing a stock to fit the socket of the machine, and bolting to opposite sides of this stock two mortising chisels; one (B) cuts out the main mortise to receive the pulley frame, the other (D) cuts out the recess for the flange of the pulley frame. As these two chisels are made of equal thickness, the width of the stock at A is made equal to the distance that the pulley-frame flange projects from the body of the frame. To enable the chisels to be set to suit varying depths of recess, the recessing chisel D is provided with slotted holes, so that it can be raised or lowered on the stock, and, as the chisels are parallel one to the other, the distance from B to D remains equal under any adjustment of either chisel. For varying widths of recess and length of flange, E C, stocks are made with suitable thickness at A, but it is obvious that different widths of chisel may be used on the same stock. As there are five different degrees of taper in the various makes of mortising machines, a separate stock is required for each kind of machine. The mortising chisel B is set against a shoulder at F, because the excessive strain would otherwise be liable in turn to cut the bolts off, which is not the case with the recessing chisel, because it is not called upon to cut deeper than, at most, about 3-16ths inch. The stocks, as well as the chisels, are made of cast steel, so that one stock will outlast many sets of chisels, and those not requiring to fit the sockets of the machine can be more cheaply made than chisels of the ordinary form. This tool is being rapidly adopted, and will, no doubt, be found a useful improvement upon present practice.




*Novelties.—Fig. 1.—A New Wood-Working Tool, Manufactured by William Thompson, New York City.*

### Sash Mortiser.

The inquiry published in our columns several months since for a device for boring a square hole has excited considerable interest, and we have had numerous letters upon the subject, not only from manufacturers of machinery, but also from users of the same, giving various answers to the inquiry. A number of our subscribers have referred to machines which they were using manufactured by different makers of wood-working machinery—among others a sash mortiser, with sash-relishing attachment, made by Messrs. Rowley & Hermance, of Williamsport, Pa., and shown in Fig. 2 of the engravings. As being of special interest to our readers at this time, we take pleasure in presenting the engraving, with a full decription. This machine is intended for making the mortise for the bars in the meeting rail and top and bottom rail of sash. The work is performed by a stationary hollow chisel, with an auger bit revolving inside. This chisel and bit mortises a square hole, cleaning the chips out of the mortise as perfectly as a common boring bit. The sash rails are placed on a table, the tenons against stops, which are adjustable to any length of rail. The table is then moved toward the chisel by the foot treadle up to the stops which govern the depth of mortise. Suitable springs force the table back after the mortise is made. The table is adjustable up and down for different thicknesses of sash. Different size chisels can be used. The sash-relishing attachment consists of table and rip saw on the opposite end of arbor from the mortiser. The relish is made by mortising the tenon of the rail and completing the relish with the saw. An adjustable guide regulates the width of tenon. In the general construction of this machine Messrs. Rowley & Hermance employ their patent adjustable journal box, the general features of which are well known to users of wood-working machinery, and it is clearly shown in the engraving on either side of the driving belt. The special advantage which this box possesses is that, being made in three parts, the caps are tightened by simply loosening the bolts and setting down the adjusting bolt in the end of the cap. The caps being adjustable to the wearing of the box, the journal can be kept central and tight until the box is worn out, thus preventing any trembling.

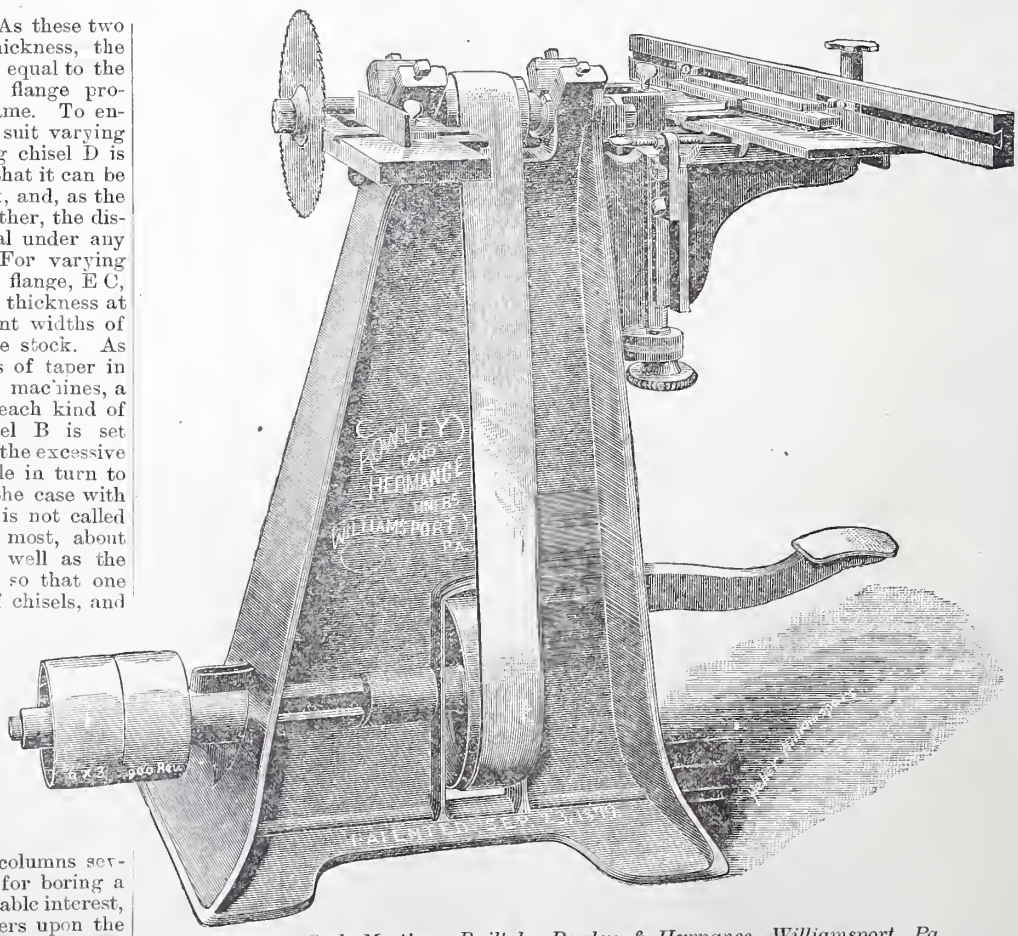



*Fig. 2.—Sash Mortiser, Built by Rowley & Hermance, Williamsport, Pa.*

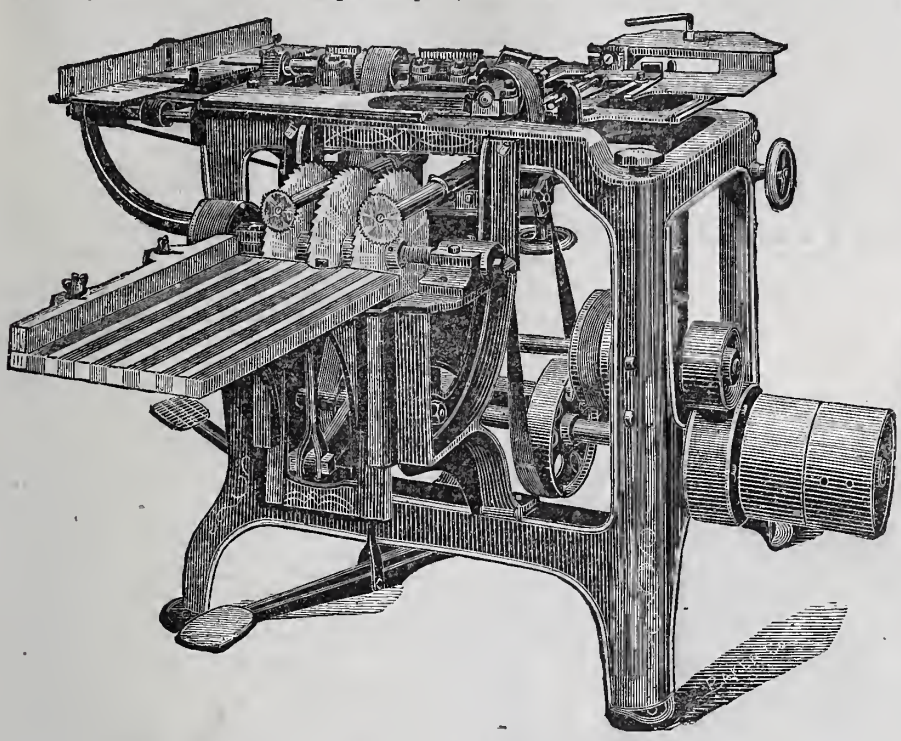
### Adjustable Barn-Door Stay Roller.

Messrs Lovejoy & Drake, of 101 Reade street, New York, are offering an adjustable barn-door stay roller for which several important advantages are claimed. The roller in its general features, including the bracket which carries it, is not unlike those commonly employed. The pieces composing the bracket are wrought iron, and the part which they support and in which the spindle of the roller is carried, is slotted, by which means the roller can be set in or out, adapting it to different thicknesses of door and making it adjustable, as various circumstances may require. The same firm are also offering a wrought-iron slide barn door hanger, which has the special advantages of being cheap and strong. The strap is of wrought iron and extends down below the rim of the wheel, running on the track in such a way as to prevent "running off." The manufacturers lay special stress upon simplicity, durability, finish and strength embodied in this device.

### Relishing and Mortising Machine.

Another machine embodying a device for producing a square hole, and one to which various correspondents of *Carpentry and Building* have referred in answer to the inquiry published in these columns a few months since, is shown in Fig. 3 of the engravings. It is a machine for relishing sash, doors and blinds, and for making the recess in the rail for the end of the rod in blinds, and the mortise for the bars in the

bottom and meeting rail in sash. The sash are relished by one operation and by one handling. This is an important consideration, since by the old methods three separate operations were required. Blinds are relished and the recess made for the end of rod by one operation also, while the old way required five. The meeting and bottom rail are also mortised by one operation, the construction of the machine making it possible to do this as quickly as a round hole could be made by a common boring bit. The chips at the same time are all cleaned out, leaving the parts ready to put together. This work is performed by a hollow chisel with a bit working in the inside. The result is a square hole made as readily as an ordinary bit will bore a round hole. Door relishing is done on this machine with five saws, as shown in the engraving, and by one handling. The manufacturers state that the capacity of the machine in this respect is 1000 doors a day. Sash and blind relishing can be done without stopping the mortising of the meeting and bottom rails or the relishing of doors. Mortising sash can also be performed without interfering with other parts. The entire machine can be run without interference of the several parts, each doing its own particular work as rapidly as when running single. This machine, which has been before the public for some years past, and has given the greatest satisfaction to those who have employed it, is manufactured by Greenlee Brothers & Co., 229 to 231 West Twelfth Street, Chicago, Ill.



*Novelties.—Fig. 3.—Relishing and Mortising Machine, Built by Greenlee Brothers & Co., Chicago.*

### Improved Jointer.

The somewhat singular-looking machine shown in Fig. 4 of our engravings represents one of the latest novelties in jointers. It is manufactured by Messrs. E. & F. Gleason, of Philadelphia, Pa. The manufacturers, in their description, state that this machine has come into quite extensive use, nearly 2000 now being actively employed by cabinet makers, sash, door and blind makers, wheelwrights, picture-frame manufacturers and makers of various novelties. Some of the purposes for which it is employed may be known from the statement that it is adapted to jointing (straight or hollow), for beveling, for planing out a twist or trueing up, for cornering, for squaring, for planing octagon, for planing taper pieces, for mitering, for smoothing and for planing draft on patterns. Five sizes of the machine are made, two of which are fitted with rabbet bit, when so required, for beading, gaining, molding, rabbeting, tonguing and the like. One great advantage to which the manufacturers direct attention, in commenting upon this machine, is the fact that the frame is cast in one piece, thereby obviating all possibility of twisting or straining the moving parts by bolting down. As may be seen by the engravings, all the movable parts are heavy in proportion to the framing. The general features of this device are so clearly shown in the engraving that the following directions for operating the machine will be readily comprehended: When the bits require sharpening, the table C is dropped down, thus making the bits easy of access. The left hand or back of the table B is always kept in line with the bits, which is accomplished by turning the hand-wheel F. The hand-wheel G raises the front table and thus regulates the cut or chip. For the purpose of jointing hollow, one end of the front table is slightly lowered by turning the screw A. For planing draft on patterns, the table is angled by turning the screw E and one at the opposite end of the table.

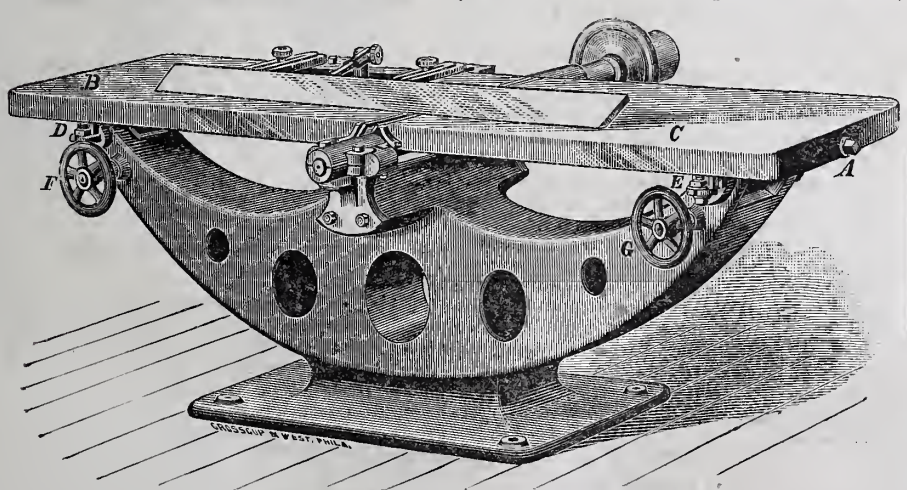



*Fig. 4.—Improved Jointer, Built by E. & F. Gleason, Philadelphia.*

### Elkin's Saw Sharpener.

In Fig. 5 we show a device for assisting the operation of sharpening saws, which will prove of interest. It is a combination of clamps and adjustable guides, by means of which the saw can be firmly clamped and correctly sharpened. The adjustable guides can be so arranged as to give the tooth any required pitch and elevation. By this means the file at once commences its work directly upon the face or cut of the tooth, thus saving the usual waste of saw, file and time. As will be seen by the engraving, the device is very simple, and its parts are so constructed as to make it strong and durable. It occupies a space of 16 inches in length and 3 by 3 in breadth and hight, when reduced to its smallest capacity. When spread for use, as shown in the engraving, the width is somewhat greater. By inspection of the engraving all the features of this machine will be readily understood. The file is fastened in the handle by a thumb-screw, as shown, nearly in line with the teeth of the saw. Between this thumb-screw and the portion which is grasped by the hand a square shank is employed, which moves freely through the sleeve fastened at the proper angle by its own set-screw, in connection with the part which moves upon the parallel guide. This sleeve swivels so that the file may be turned to present any desired angle against the teeth. The parts which slide along the guide-rod swivel also, thus making it possible to present the file against the teeth at any angle with the direction of the saw that may be required. The guide, running parallel to the saw, is fastened at either end to the clamp, and in turn swivels, thus making it possible to bring the file against the teeth at

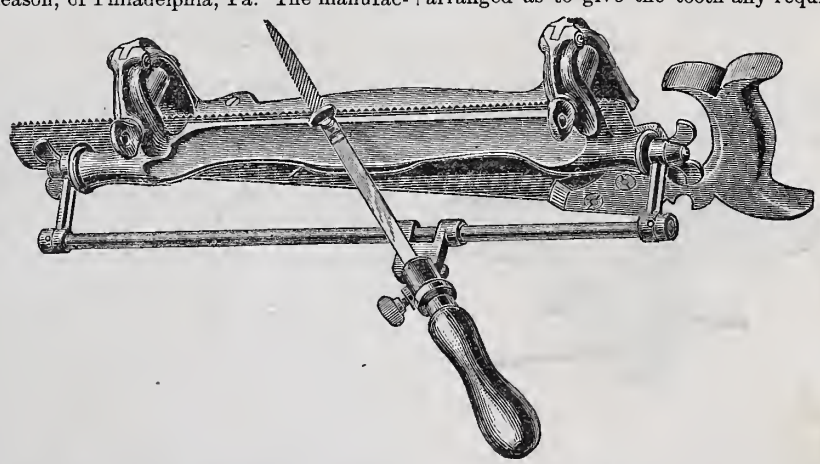
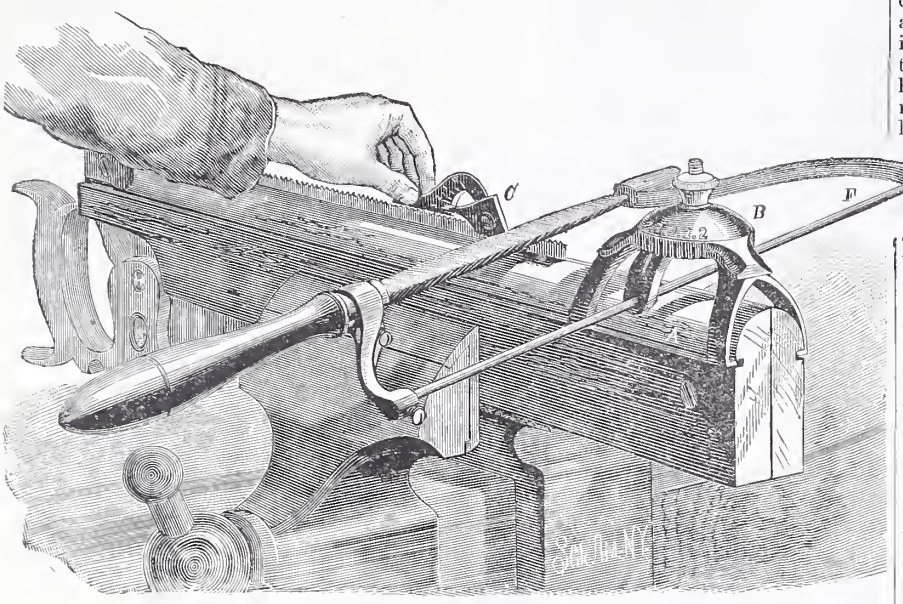


*Fig. 5.—Elkin's Saw Sharpener, Manufactured by Aborn, Haskell & Co., Boston, Mass.*

any desired hight. In use the clamp is screwed to a bench, the saw being passed between the two parts and coming in contact with rubber buffers, thus preventing injury to the teeth against the metal hinges. Altogether the device has been carefully considered and seems well adapted to meet the wants of careful saw-filers. It is manufactured by Messrs. Aborn, Haskell & Co., 592 Washington street, Boston, Mass.

### Roth's Saw File Guide.

A correspondent several months ago, writing from Stantontown, Ohio, referred to a saw-file guide which he had employed for some time past very satisfactorily. His reference to the device brought a flood of inquiries to this office, our readers naturally desiring to know by whom the guide referred to was made and where it could be obtained. We take pleasure in presenting herewith (Fig. 6) an illustration of the saw-file guide referred to. It is manufactured by Messrs. E. Roth & Bro., New Oxford, Pa. While this device may be a novelty to many of our readers, it has been before the public long enough to have demonstrated its utility. We learn from the manufacturers that, although it was patented as recently as 1876, over 20,000 have been sold. Some improvements were pateuted only last year, and the engraving present d herewith shows it in its best form. In use the saw is held in a wooden clamp. A circular plate, B, has figures on its upper side agreeing to a scale marked on its edge for setting the file to a bevel for either side or square across the saw. Legs extend from this plate over the clamp into grooves, as will be seen in the engraviug. On the under side of the plate are a number of grooves, not visible in the engraving, agreeing to the scale on its edge, into which a raised rib on the arched piece meshes and is held in place by the thumb-nut shown on the top of the plate. Through the ends of the arched piece slides the rod F, to which are secured by screws the arms that carry the file. By loosening the thumb nut on the top of the plate the file is readily changed to any desired bevel, and the handle of the file may also be lowered if desired. At C is shown an indicator for setting either a three-cornered, flat or half-round file on the pitch. The file, being set on its bevel, is securely held by the thumb-nut on the top of the plate, and on the pitch is held by the set-screw in the socket of the arm of the file handle. The rod F, sliding in the arched piece under the plate, guides the file, so that each tooth will be filed to the same and equal bevel and pitch, and each tooth will be of equal size when filed to a sharp point, while at the same time the action of the file is free and its cutting satisfactory at both point and heel or large end. The manufacturers state that this device will file a saw equally well whether it is full, hollow or straight on its edge. It will also file circular saws by the use of a special clamp which they construct for the purpose. This clamp does not differ materially from the one shown in the engraving, save that it is deeper and is provided with a pin, which forms the axis on which the circular saw rests during the operation of filing. In connection with this filer, the manufacturers furnish a table which is arranged and figured for giving the required bevels and pitches for the kiud of saw to be filed, thus reducing to a minimum the experience needed to put a saw in perfect order.




*Novelties.—Fig. 6.—Roth's Saw File Guide.*

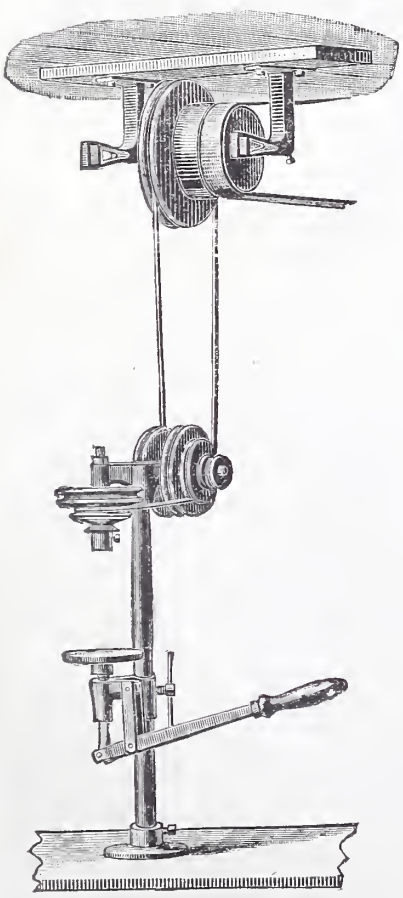


*Fig. 7.—Small Power Drill, Built by Champlin & Spencer, Chicago.*

### Small Power Drill.

The drill shown in Fig. 7 of the engravings, which is manufactured by Messrs Champlin & Spencer, of 152 and 154 Lake street, Chicago, Ill., is designed to fill a want with many persons who are desirous of drilling holes from ½ inch down to smaller sizes, without being obliged to purchase higher-priced larger and heavier machines. The pulleys of the drill afford three speeds, and are made of hardwood, as are also those on the countershaft. The diameter of the fast and loose pulleys on the countershaft is 5½ inches, with face width of 1¾ inches. The diameter of the large driving pulley on countershaft is 9½ inches, with a face of 1½ inches. The distance between the end of the spindle and the table, when the same is lowered as far as possible, is 13 inches. The distance from standard of drill to center of table is 3½ inches. The extreme hight of machine is 26 inches. The diameter of table is 5 inches. The weight of drill and countershaft is 42 pounds. The spindle has a ½-inch hole for receiving drills. In belting, the machine requires 15 feet, ⅜-inch twisted belting where it is used in a shop having a 12-foot ceiling. The table can be raised or lowered 2 inches by means of the lever. By the device on the back of the drill the table with lever attachment can be raised or lowered to suit the work being done, or it may be swung to one side entirely out of the way. The manufacturers offer this machine as well made in every part, and state that good material is used in its construction. It is so fitted as to run true, and is guaranteed to do satisfactory work. It is hardly necessary to point out in this connection where a small and cheap machine of this kind can be made extremely useful. Although wood-workers do not ordinarily do drilling, it frequently happens, in the equipment of shops and planing mills, that a tool of this kind would save much time in sending out for such drilling as is required in connection with various classes of work manufactured.

### Cadwell's Roofing Bracket.

We have already directed our readers' attention in this department to various devices convenient for use in shingling and in repairing roofs. In Fig. 8 we show Cadwell's patent adjustable roofing bracket, which differs materially from any to which we have thus far called attention. It is of wood, save only the pins and plate by which it is secured to the roof, and is of larger dimensions than those which we have previously described. The engraving gives a very fair idea of the device. The view shown to the right indicates the bracket extended ready for use, being set to the middle pin or to a pitch midway between the extremes to which it is adapted. The view to the left shows the bracket released and partially folded, indicating the general shape which it assumes when not in use or when being lifted from one place to another. The bracket is secured in place by three nails driven very nearly home, in such a position as to be covered by a succeeding course of shingles. Holes corresponding to the nails are punched in the upper end of the plate L, and from these holes slots are made, thus enabling the operator to hook the plate upon the nails in a secure manner. As the work progresses these nails are covered by a shingle, as shown in the view to the left, and the bracket is removed by sliding it upward in the direction of the roof line and then raising it sufficiently to lift it over the heads of the nails. The specimen which the manufacturer, Mr.

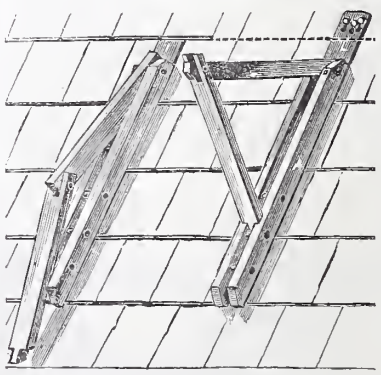


*Fig. 8.—Cadwell's Roofing Bracket.*

C. H. McIntire, of Reading, Mass., has sent us is a very fine sample of workmanship and material, in all particulars. While the parts in themselves are light, the quality of the material and workmanship would seem to justify any one in using it, although so much depends upon its strength.

## Furnace Air-Supply Boxes.

Mr. Edgar Holden, of Newark, N. J., writes as follows in a recent issue of the *Sanitarian:*

One of the most incomprehensible defects in the architecture of dwellings, and only equaled by the venerable but still vigorous folly of connecting the sleeping-room with the sewer, is that of the cold-air box to the furnace. We find men who have endured repeated and unaccountable sickness in their families for years becoming dimly conscious that the air from the bottom of the cellar is not improved for breathing purposes by being sucked beneath a furnace and heated over the perniciously pervious hot iron, and see them rising to the emergency by changing it for the stagnant and offensive air under the back piazza or the neighboring alley, and calmly contemplating their device as a great sanitary accomplishment. To ask such a man whether he would lie all night on the cellar bottom or under the neglected piazza would be to impugn his common sense, but he may, nevertheless, be well aware that the poisonous vapors on which he instinctively builds his sleeping room above cling and accumulate near the surface of the ground. He may also be aware that in cold weather these emanations and germs of disease are torpid, and often innocent until warmed into activity like the serpent in the fable, but he has probably never associated the two facts, or, if he has, he falls back upon the intelligence of his architect, or perhaps the brilliant wisdom of the family plumber.

An extensive experience has convinced me that much of the sickness prevailing in cities in the winter arises in this way. The absence of, or defective arrangement of, the cold-air supply to the heater fills the house with disease germs, and the weather strips and double windows and carefully closed doors shut them in till the wives and children become hot-house plants—sensitive and frequently ill, and only not dying, as such plants would, because endowed with greater powers of resistance. It would be easy to enumerate, as rapidly as the alphabet, families in which the lighting of the furnace is connected with colds, sore throat, subacute bronchitis or other difficulties, and to decide without inquiry in which houses the supply of air to the furnace comes from the cellar. It matters somewhat, of course, whether the cellar is the receptacle for rubbish and decaying vegetables. But there are few cellars in which the dampness of summer has not provided the vegetation necessary to the supply of poison for the winter's warming, and, whitewashed never so clean, the crevices and flooring, the boxes and barrels, will nourish more or less of plant life ever subject to decay.

This evil, singularly prevalent as it is, needs but to be stated to be evident, and the remedy will perhaps at once suggest itself; It is certainly simple, viz.: To run the cold-air flue up by the side of the house to a sufficient hight to obtain pure air, and be sure to have it air-tight in its passage through the cellar to the base of the furnace. For about four years my own house has been thus supplied, but not without opposition on the part of the builder, who maintained that the heated air would all go outside. The principle, however, was correct, and the downward draft is in cold weather so great as to require almost the complete closure of the valves to avoid chilling the pipes, and the air supplied is always fresh and pure. The cold-air boxes thus supplemented need not to be large. A city dwelling 25 x 75 feet and 50 feet high requires but one shaft, 14 x 12 inches in the clear, and extending from 15 to 25 feet upon the level of the ground. This could readily be built in the wall, or be a flue left in the main wall of the house, with grated opening high above reach. The principle involved and already alluded to is a simple one. The air in the shaft, being cold, and that of the furnace or coil-boxes warm, would of necessity fall to replace the hearted air, which from equal necessity must rise inside the house, and this would be true if the shaft were a chimney rising to the roof.

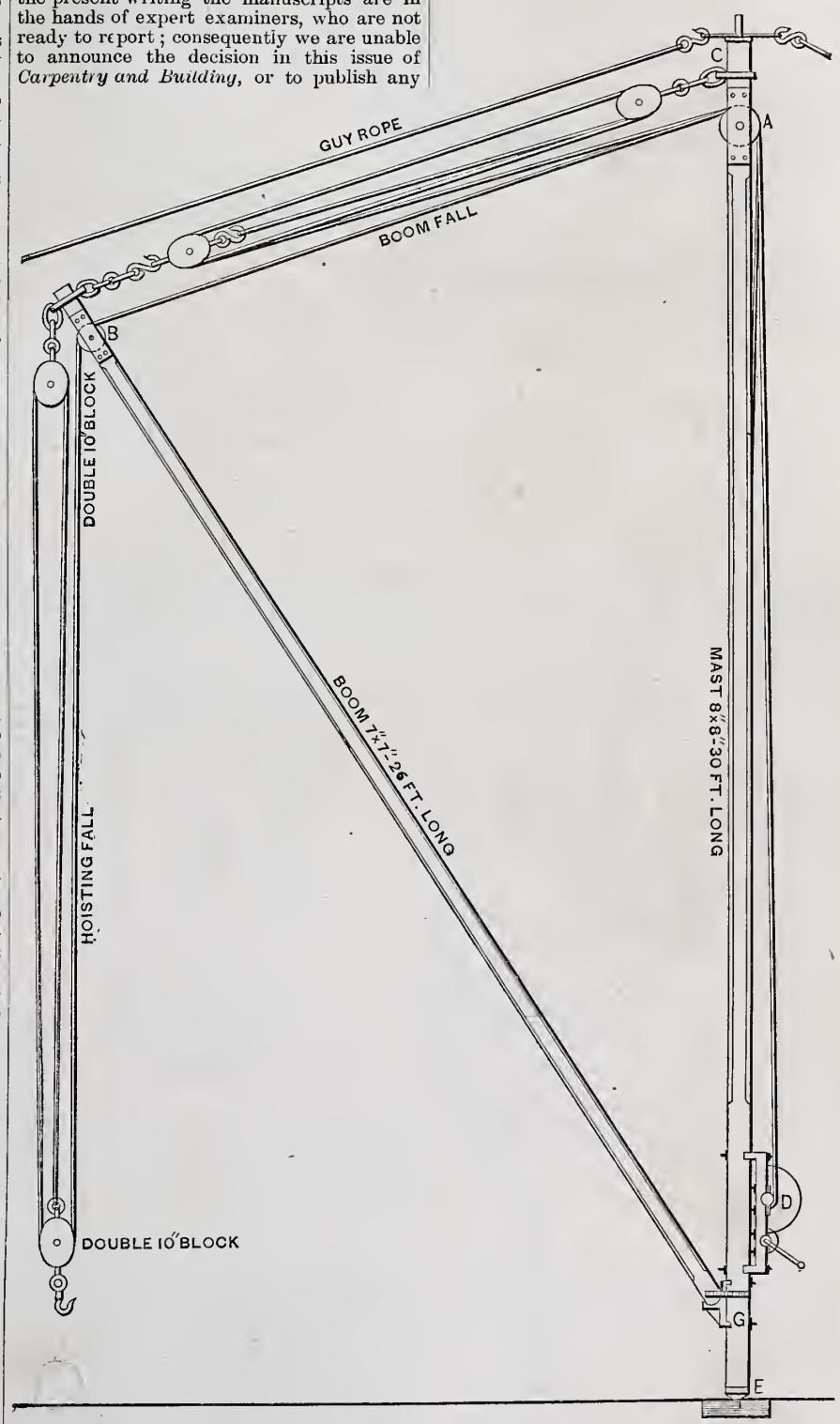
## The Estimate Competition.

In the estimate competition a number of very fine efforts were submitted, and at the present writing the manuscripts are in the hands of expert examiners, who are not ready to report; consequently we are unable to announce the decision in this issue of *Carpentry and Building,* or to publish any of the estimates sent in. We hope to be able to lay before our readers some of the results of this contest in an early number.

Messrs. Bradley & Currier, of 54 and 56 Dey street, have issued a circular informing their patrons that there will be no delay consequent upon the burning of their Twenty-fifth street factory on the 10th ult. Arrangements have been made by which all orders for doors, windows, mantels, frames, moldings, &c., will be filled with the usual promptness of this firm.

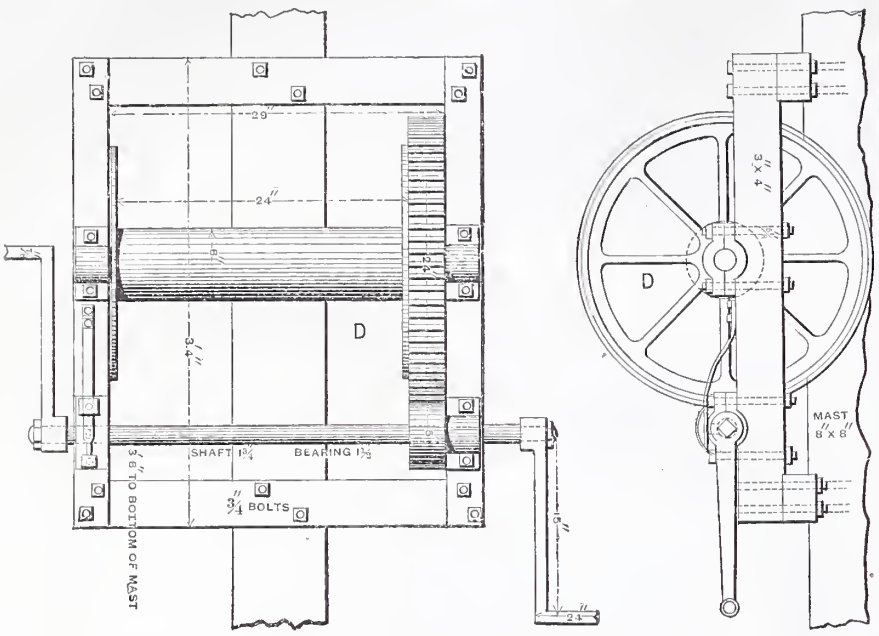
## A Hand Derrick.

A short time since the *Engineering News* published some drawings contributed by Mr. T. Appleton, of Council Bluffs, Iowa, representing a 30-foot hand derrick, of a character adapted to the uses of builders and contractors generally, which, we have thought, would be of interest to our readers. Accordingly we have re-engraved the drawings, and now take pleasure in presenting them to our readers in such shape as will, we think, adapt them to general use. In his description Mr. Appleton states that there are many occasions for using a light, portable derrick when one not would consider it worth while to set up a large one. For instance, in digging a well, the derrick here described could be employed with a single block to raise the tub. The crank shaft and drum would be removed, and in their place a snatch-block would be attached. Arranged in this manner a good pair of horses would hoist a tubful of earth quickly and swing it




*A Hand Derrick.—Fig. 1.—General View of the Device with Dimensions.—Scale, ¼ Inch to the Foot.*

so as to dump at least 40 feet away from the well. For loading and unloading stone or heavy timber, or for building a heap of coal, as well as for building masonry under a bridge, a small derrick will save its cost in




*A Hand Derrick.—Figs. 2 and 3.—Front and End Elevations of Crank and Drum.—Scale, ¾ Inch to the Foot.*

short time. The derrick here shown has a mast 8 x 8 inches, 30 feet long, made of square timber with corners chamfered off, except where the gearing and sheaves are attached. The boom is made of a piece 7 x 7 inches or 8 x 8 inches, as may be preferred, and 26 feet long, with the corners chamfered, except at the base. The butt of the boom is rounded to a half-circle, with a pinhole at the center. At the top, as indicated by A, are two 10-inch by 1¼-inch sheaves, one on each side of the mast. The hoisting fall passes over one and the boom fall passes over the other. At B, on the end of the boom, is a single 8 x 1¼ inch sheave attached in the same way as those at the mast head. If preferred, this sheave could be placed in a mortise through the center of the boom. At C, at the mast head, is a cast-iron bracket, with rib at top and bottom secured to the mast by three bolts, two being used above and one below. The U-shaped band passing around the mast holds the boom in place, but the bracket G supports the weight. The

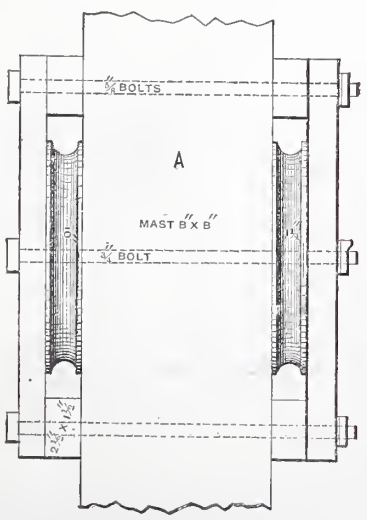



*Fig. 4.—Detail of Masthead, Showing Edges of Sheaves for Boom Fall and Hoisting Fall.*

details of construction, which are clearly shown in the engravings, make the features of this device so plain that extended description is not necessary. The intention, Mr. Appleton states, was to make all the ironwork as simple as possible and strong enough for the work contemplated. The step casting should be bolted with ¾-inch lag screws to a block of oak, say 16 x 20 inches in size and 4 inches thick. There should be two bolts through the oak piece horizontally, projecting 4 inches on each side, to serve as fulcrums for bars in moving the

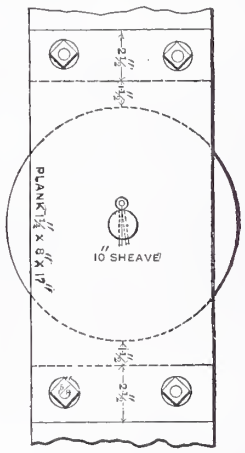



*Fig. 5.—Side Elevation of Masthead.*

derrick. Nothing about this device is claimed as original, and many of our readers may know of better ones. It, however, affords a scheme of construction for those who are in need of anything of this kind.

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Terra cotta as a material for building, or, more correctly speaking, for ornamenting buildings, is becoming very fashionable, and the beauty of its decoration and its many good qualities, notably durability, are bringing it into use for a variety of purposes never before dreamed of. This is unfortunate in some respects, because it is being applied in places where the nature of the material renders it exceedingly unsuitable, and the same may be said in regard to much of the ornamental brickwork used inside of buildings. Terra cotta, like any other piece of burnt clay, is comparatively fragile, and when corners are knocked off and ornaments defaced, few things are more unpleasant to look at. We have recently seen delicate pieces of terra cotta applied in such a way around mantel-pieces and chimney breasts as to almost insure their destruction by the careless hands or feet of those who come near. Jambs of doorways and string courses, either outside or inside of buildings, where the hands or persons of passers-by are likely to come in contact with them, are hardly safe places to trust either ornamental brickwork or any piece of terra cotta. In one of the most stylish of the recently-finished office buildings in this city the chimney-pieces, with the exception of the mantel-shelf, are of ornamental brick and terra cotta. The details are sharp, and the moldings and raised ornament of a very delicate character. The building has hardly seen its first year of use, and yet chipping has commenced in a way that is anything but agreeable.

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## English Building Trades Exhibition.

It is the custom in England to have annual exhibitions devoted particularly to the interest of the building trades. The one for the current year has just closed in London, having been held in Agricultural Hall. Reports that have reached us show that exhibitions of this character have increased in popularity by stated degrees ever since they were originated. They are designed to demonstrate the best methods employed in modern building, and the exhibitors know that where the most recent improvements are gathered together under one roof there will be attracted architects, contractors and people generally who are interested in building matters. This com-

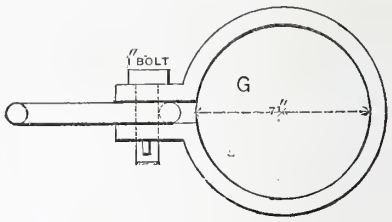



*Fig. 6.—Ring near Head of Mast, to Hold Boom Tackle.*

munity of interests, the desire of inventors and manufacturers to succeed in the competition for priority, and the anxiety of the capitalist and builder to find out who offers the greatest efficiency and economy, insures commercial success for exhibitions of this character, while the manifold objects of interest appealing to all classes of the community maintain their wide popularity. The modern builder has to deal with many trades, and the exhibition just closed in London, as on previous occasions, was of a diverse character. As a whole, it contained a larger number of practical exhibits connected with the building trades than has been entered upon any former occasion. From a recent account in the London *Times* we take the following brief description of what the exhibition contained:

Beginning with architecture, there were in one of the galleries about 300 designs and drawings of executed works lent by architects. In these days the builder requires very largely the aid of the brickmaker, and it is but fitting that there should be a large assortment of exhibits connected with this trade. They comprised brickmakers' and builders' machinery, brick-making machines, brick molds, and an extensive variety of the modern brick in individual specimens and

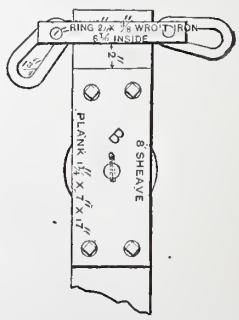
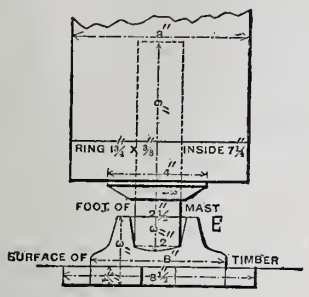



*Fig. 7.—Outer End of Boom.*

as part of finished pieces of plain and ornamental building. There were bricks glazed, carved, molded, pressed, ornamental and metallic; bricks made by hand and machine; bricks red, blue, buff and white; bricks for ventilating, and bricks of special resisting power. Artificial stone having largely taken the place of the quarried material, by reason

of its uniform texture and resisting qualities, concretes, which are coming into general use for sewer and water mains, inverts and sanitary purposes, found a prominent place. Woodwork, of course, was fully represented, from the mortising, tenoning, planing and sawing machines, without which the execution of large contracts would now be impos-




*A Hand Derrick.—Fig. 8.—Foot of Mast (Elevation).*

sible, to the beautifully-polished furniture, which requires nothing more than a ready purchaser. The specimens of decorative art were the strong features of the exhibition. There was a good deal of highly artistic work in terra-cotta and mosaic and encaustic tiles. The latter are prepared for fireplaces, stove linings, dados, washstand backs and other purposes, and upon some of the best, under the glaze, are painted flowers, birds and figures. The architectural terra-cotta admits of rich artistic development. as many well-known buildings testify, and several of our most eminent firms exhibited in this department. Stained and painted glass,

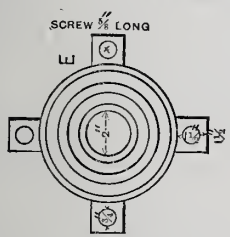



*Fig. 9.—Plan of Foot of Mast.*

as employed in the modern dwelling, was another branch of the building trade exemplified in the Agricultural Hall, and there were two or three stands of beautiful art medal work. In the same category should be mentioned the artistic wall papers and the decorative wall papers called Lincrusta-Walton. This was much noticed last year. It has ornaments in *relievo*, somewhat resembling fine wood carving, may be readily washed and is damp-proof. Coming to essential details of house-fitting, there were innumerable appliances for heating, lighting and ventilating, and sundry inventions which will be of deep

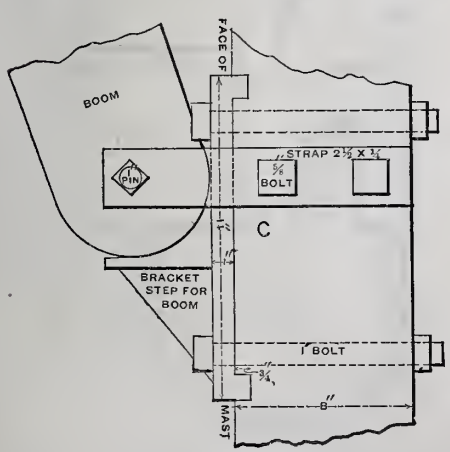



*Fig. 10.—Side Elevation, Showing Fitting for Bottom of Boom.*

interest to sanitary and hygienic reformers. At two stands the capabilities of Scogliola marble for columns, pilasters, wall-linings, dados, architraves—and, indeed, all forms of interior decoration—were set forth, and the exhibits included a sample of one of the dados fixed at the Carlton Club. There was, in short, scarcely any distinctive portion of a dwelling house which was not in whole or part to be seen at the exhibition. Under the galleries was an interesting collection of machinery used in the building trades, some of the engines being propelled by gas and others by steam.

## A Novel Schoolhouse Plan.

We have received from Mr. W. L. Kramer, of Finley, Ohio, a postal card which contains a plan of a very novel schoolhouse, and which he designates as the "XX" school-

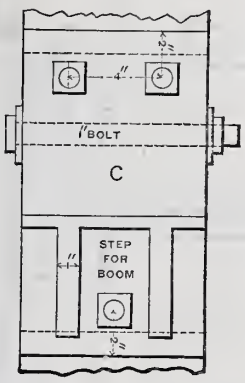



*Fig. 11.—End Elevation Corresponding to Fig. 10.*

house. Probably this name has been derived from the fundamental principles of the ground plan, which is not unlike two crosses of equal arms laid over each other so that the arms of the one project into the angles of the other. The arms of the two crosses are of different width and length, or, to express it differently, they may be regarded as two sizes of the same general shape, the lesser one lying on top of the larger. The arms of the smaller cross in this schoolhouse plan are utilized for entrances, halls, stairways,

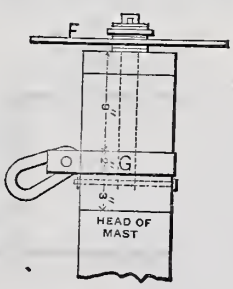



*Fig. 12.—Head of Mast.*

passages, &c. The arms of the larger cross form the school-rooms, the position of the teacher in each being at that end nearest the center of the building, or nearest the intersection of the several arms of the crosses. Mr. Kramer, in his circular, points out that this schoolhouse has 24 advantages over other buildings containing 8 and 12 rooms. Among these advantages we note the following: Every room has its own entrance, and light and ventilation on three sides; every room on the second floor has its own stairway; every room has also its own cloakroom, and the several rostrums are where the teacher can see pupils coming and going; the large central hall is well lighted and well ventilated; all steps to the first floor are on the inside of the building; each room has a flue for stoves, heaters or steam; the building has better fire-escapes than other plans; pupils will not conflict inside the building in coming in or going out; there is uniformity of entrances and stairways; the bell tower is in the center and the chimneys are in the comb of the roof; the building is exactly alike in all four sides and presents a finer appearance than any other. Concerning the last two claims of the designer, it may be that some of our architectural readers will not agree with them. The author, no doubt, has studied the matter very carefully, and perhaps bases his opinion upon a perspective view which he has constructed of his design, or he puts forth this opinion after having built one of the schoolhouses and had it thoroughly tested. We learn from the circular that Mr. Kramer has copyrighted this floor-plan, and that he makes a specialty of

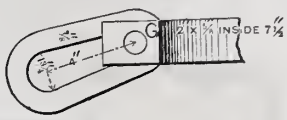



*Fig. 13.—Detail of Link at C, Fig. 1.*

furnishing drawings and specifications for houses of this general character. While the spread which Mr. Kramer obtains to this building by its peculiar plan has undoubtedly some of the advantages to which he lays claim, there are also certain disadvantages which no doubt will occur to those of our readers who study it critically. The advisibility of constructing buildings in a style differing so radically from that which long usage has sanctioned can be determined only by careful experiment. We shall watch Mr. Kramer's success with this novelty with great interest.

## New York Apartment Houses.

Some idea of the rents which are paid for flats in fashionable houses may be gained from the schedule of prices for apartments in the new buildings overlooking the Park on

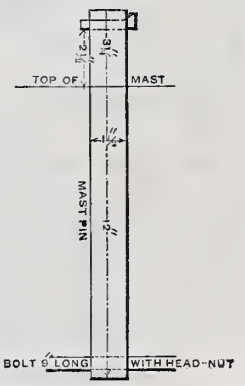



*Fig. 14.—Mast Pin with Wrought Iron Split Key.*

Fifty-ninth street, between Sixth and Seventh avenues. Of eight huge buildings to be erected on this block, four are now nearly finished. The estimated rental of one of these houses, containing twelve apartments, is $72,000 per year. To stockholders in the proprietary association the amount required as an investment is calculated on the follow-

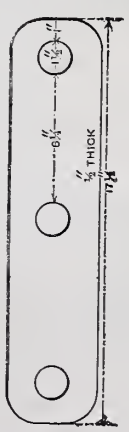
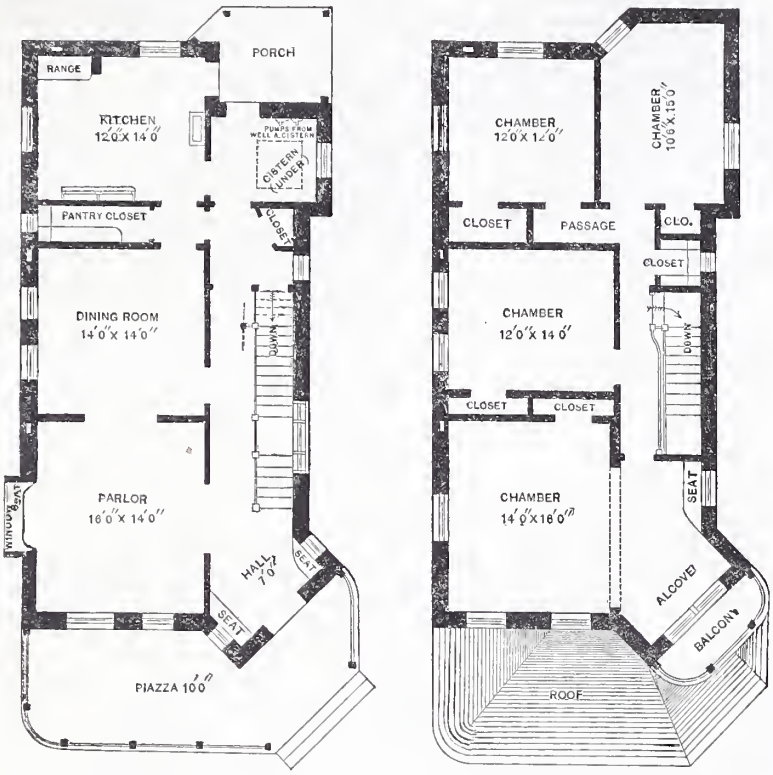



*Fig. 15.—Guy Strap.*

ing basis: Valuation of ground, $250,000; capital stock (building stock), $280,000—or a total first cost of $530,000. This is divided among sixteen shareholders, each of whom is expected to pay for his share of the capital stock $15,000, and to become liable for his share of the yearly charges. These con-

sist of ground rent, varying from $10,000 to $15,000; $3500 to $5700 for taxes; $600 for janitor; $950 for four hall-boys; $1300 for engineer and assistant; $1200 for coal; gas for halls, $150; water tax, $200, and minor items $400 a year. The total yearly charge for the most expensive of these buildings is $26,100. Subtracting this from the estimated rental, $72,000, we have a balance in round numbers of $46,000 accruing yearly from a capital stock of $280,000, or nearly 16½ per cent. In some of these buildings, if the stockholders should let their apartments instead of occupying them, they would net 18 or 19 per cent. per annum on their investment. For individual apartments, the proposed rents to yearly tenants vary from $3000 to $5000 for an entire floor.




*Floor Plans by "Islica," No. 13.—Scale, 1-16th Inch to the Foot.*

## Plans for Seven-Room Houses.

In the competition for floor plans of a cheap seven-room house, a large number were submitted which, in the estimation of the Editor of *Carpentry and Building*, were worthy of publication, although they were rejected for prizes upon the part of the committee which had the decision of this contest in charge. Our space, however, does not permit extended selections of this kind, but we present herewith four sets of plans which are characteristic in themselves, and which also present many features of interest to our readers. We shall not occupy the space necessary to present a detailed description of these plans. Suffice it to say that each one is worthy of careful consideration upon the part of all who are giving attention to the subject of a seven-room house, and that each will repay a little consideration of its features. We suggest to our readers, therefore, that they enter the front door of each, inspect the hall, parlor, dining-room, kitchen, porches, closets, &c., on the lower floor, then ascend to the second story and in a similar manner examine the various features there presented. After thus viewing the house an opinion will be formed of its merits more correct in its terms, possibly, than anything we could present were we to write a column of description.

Probably the largest mass of rock that has ever been transported, not excepting even the blocks in the Egyptian Pyramids, was that from which was cut the pedestal of the statue of Peter the Great, in St. Petersburg. It was a block of granite weighing 3,000,000 pounds, or about 1500 tons, and was found isolated on marshy ground about four miles from the Neva.

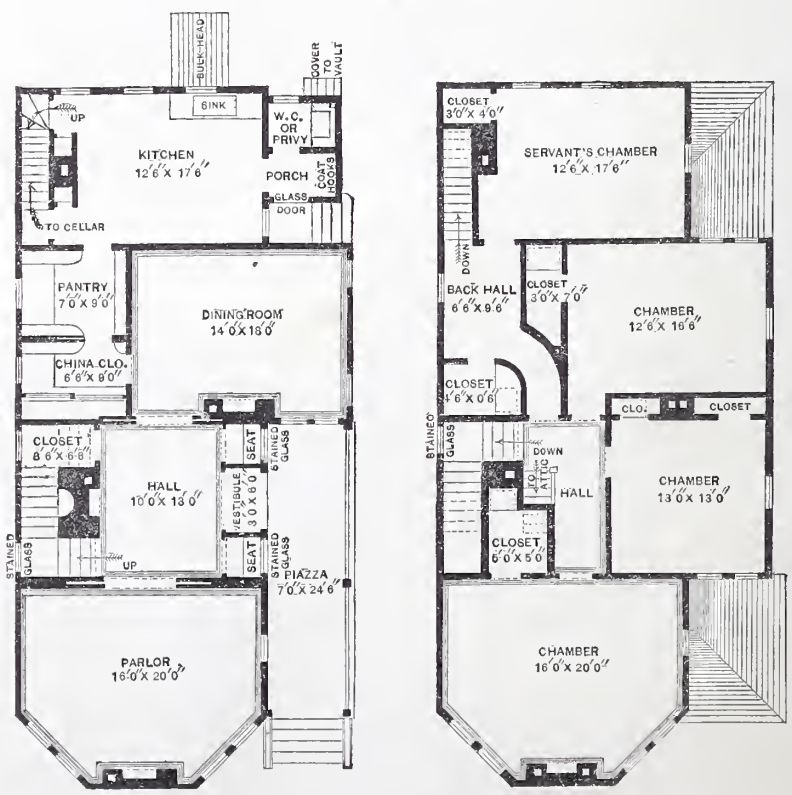
## NEW PUBLICATIONS.

HAND-RAILING AND STAIR-CASING. A Complete Set of Lines for Hand Rails, by "Square-Cut" System, and Full Practical Instructions for Making and Fixing Geometrical Staircases. Illustrated by upwards of 100 Working Drawings. By Frank O. Creswell. Published by Cassell, Petter, Galpin & Co. Price, $1.50

This little volume is one of Cassell's technical series, and, the author says, has been prepared with the hope that it will encourage the working joiner to study drawing. The book contains about 100 pages, almost every one of which has a diagram illustrating the special part of the subject under consideration. A number of folding plates are also introduced. The engravings are clear and distinct, and the explanatory text serves to make the author's meaning easily understood. Mr. Creswell is of the Liverpool School of Science, and this work was prepared specially for use among the mechanics of Great Britain. Some of the methods shown are essentially English in character, but are none the less valuable on that account. Mr. Creswell approaches his subject from a little different standpoint from that occupied by certain American authors whose works have been largely circulated, and he treats it in a different way. The system of hand-railing introduced, he states in his preface, is simple and accurate. By its means the face mold can be struck out on the material from which it is to be cut without the usual labor of projection and transferring. The author says that, although this work is complete in its particular department, the student is recommended to read along with it the volume in the same series on "Drawing for Carpenters and Joiners." This work has already been noticed in our columns. The volume has the advantage of being the smallest, if not the cheapest, work on hand-railing now before the public. It is of pocket size, and therefore, so far as portability is concerned, is of great advantage over some of the unwieldy volumes that are generally sold.

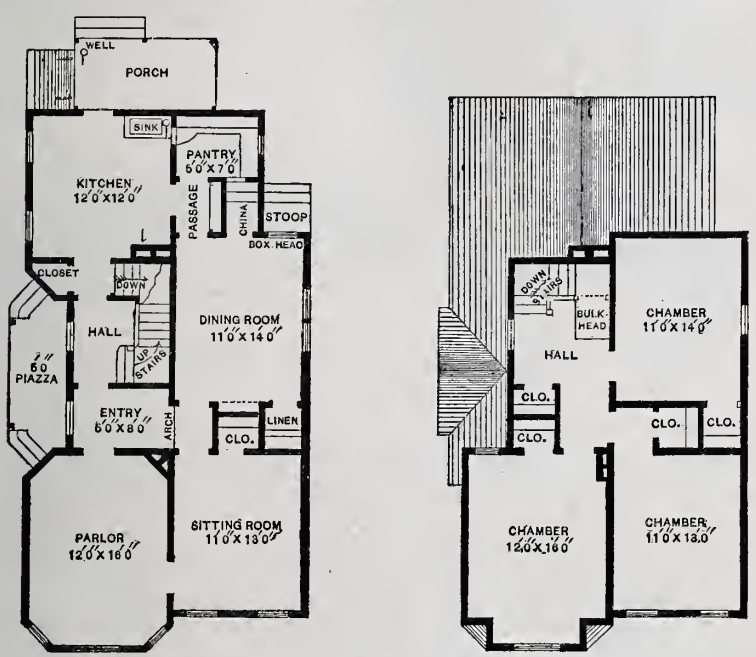
PRACTICAL CARPENTRY. Being a Guide to the Correct Working and Laying Out of All Kinds of Carpenters' and Joiners' Work, to which is Prefixed a Treatise on Carpenters' Geometry. By Fred. T. Hodgson. Published by the Industrial Publication Co. Price, $1.

The author of this work has issued several volumes during the last few years on topics of great interest to carpenters and builders generally, among which may be mentioned "The Steel Square and Its Uses," "Builders' Guide and Estimators' Price Book," "The Slide Rule and How to Use It," and others which have been reviewed in our columns. From his long connection with the building trades in the capacity of editor of one of the oldest building journals in this country, and from practical experience in the work described, Mr. Hodgson has eminent qualifications for what he has undertaken. In his preface to the present volume the author says that in offering this work he desires it to be understood that it is not intended to take the place of any of the larger and more exhaustive works on the subject. It is designed more particularly for use as a hand-book by the workman who has not had time or opportunity to thoroughly commit to memory the principles it contains, and to occupy a small corner in the workman's tool chest, so that it may be referred to for consultation whenever circumstances require it. This gives the key to the vol-




*Floor Plans by "Venture," No. 33.—Scale, 1-16th Inch to the Foot.*

ume, and will enable our readers to form a fair idea of its general scope. The first 34 pages of the book are devoted to carpenters' geometry, in which those problems are considered that are of special importance in such work as builders undertake. Followlng this, the subject of arches, centers, windows and door heads is considered. Next in order is roofs, in which various kinds are described, following which an explanation of different styles of framing is given. Numerous rules are introduced for the calculations necessary to be made in connection with roof work. Diagrams are introduced to show how the cuts in the various timbers employed are to be obtained. Following the general subject of roofs comes covering of roofs as a subdivision. In Part V mitering moldings is treated, in which the geometrical principles of getting the joint between level and rake molding, as well as the method of determing the cuts in the miter box for different purposes, are thoroughly explained. Following this come sash and skylights, and then moldings are treated. In Part VIII joinery is taken up, in which various kinds of joints are illustrated and described. Miscellaneous problems are then introduced, after which timber work is considered. Swing joints receive attention in Part XI, while the concluding chapter is devoted to useful rules, tables, data and memoranda convenient for reference in estimating and in the practical execution of work. Illustrations are freely employed throughout the book, and no one who buys this volume can fail to find much useful information in it.




*Floor Plans by "Home," No. 20.—Scale, 1-16th Inch to the Foot.*

HINTS ON BUILDING. By J. H. Carpenter; published by the author. Pamphlet. Price, 50 cents.

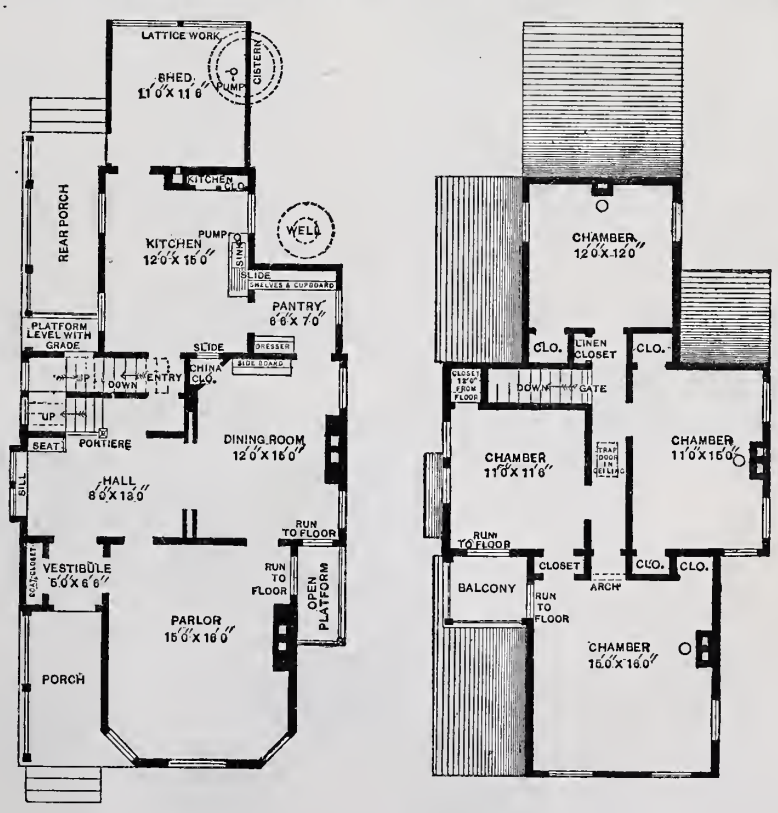
This little work of 50 pages has been prepared by an architect who has given the subject of construction most careful thought. He has brought together a great deal of information upon topics that are necessary to consider, both upon the part of those about to build and those engaged in the practical execution of work. The object, the author states, has been to present the most important facts about the practical work of building, to aid in securing the highest order of beauty in the art and workmanship which shows cultured taste in a common-sense course of construction, and to prevent, so far as possible, the crowded effusions of ornament and to show that the most humble attempts are worthy of study and adaptation to laws of harmony and order. After considering briefly the preliminaries of building, practical details are taken up in a general way as hints in divisions of labor and trade work, and in subdivisions so clearly marked that they can be readily applied where the class of work described is only to be partially used in building. Technicalities, the author continues, have been carefully avoided, or explained so that the suggestions may be understood by the non-professional as well as experts in the business, and hints about labor and quantities are given in such a way as will enable any one, with a little study, to make approximate estimates of cost. The work throughout contains much that is of importance to all who have anything to do with the building business.

For the most part, the author manifests a familiarity with, and a thorough understanding of, the materials and workmanship which he describes. In some portions, however, he shows that even a practical constructing engineer may make mistakes. For example, under the head of "Tinning," the assertion is made that "tin sheets are 10 x 14 inches in size and of different thicknesses, sized by X, XX and XXX. XX is the best for general use, as the metal is thin, pliable and less likely to crack under strain of construction than thicker metal." Very few roofers at the present day would think of covering a building with tin 10 x 14 inches in size; 14 x 20 and 20 x 28 are regular roofing sizes, and are almost universally employed. The ordinary thickness of tin used for roofing is known as IC, and is one gauge thinner than that indicated by the author above as X. By wire gauge it would be No. 29; X would be No. 27. The employment of XX and XXX is very rare indeed in any part of the country, and there are good reasons why metal so thick as these gauges should not be used where it is necessary to work it in the shapes required by the seams and joints in tin roofing. In some other particulars this author might be similarly criticised, but for the most part, as we have already stated, his suggestions are good and well worthy the attention of the building trades.

SAW FILING. A Practical Treatise in Popular Form. By Robert Grimshaw. Published by John Wiley & Sons. Price, $1.

This little book is for the most part made up from selections from the author's larger work on saws, a notice of which appeared in our columns some months since. It is freely illustrated, and in a fairly concise manner presents much information about saw-filing and the use of saws for various purposes. Mr, Grimshaw, in his larger work on saws, has been industrious in compiling the information in the possession of saw manufacturers, and has gotten together in one volume very much of what is current on this important topic. In preparing this smaller book, limited, as its title indicates, to the filing of saws, he has selected simply those portions of the larger book, including illustrations, which bear upon it. While this little volume is of use to all who have the care of saws, in giving hints and explanations of theoretical principles on which practice may be based, those who come to it for practical directions, without the benefit of some experience of their own and some general knowledge of the subject, are likely to be disappointed. The directions are brief, and the use of terms peculiar to saws are given without explanation in such a way as to limit its usefulness. In size and general appearance this treatise on saw-filing is not unlike the one by Holly, already noticed in our columns, published by the same firm.

The new County Clerk's office that is in course of erection at Albian, N. Y., is very nearly completed. It is constructed of brick and stone, with an iron roof. Besides the office of the County Clerk, the building will contain the offices of other county officials. The cost is put at $20,000.

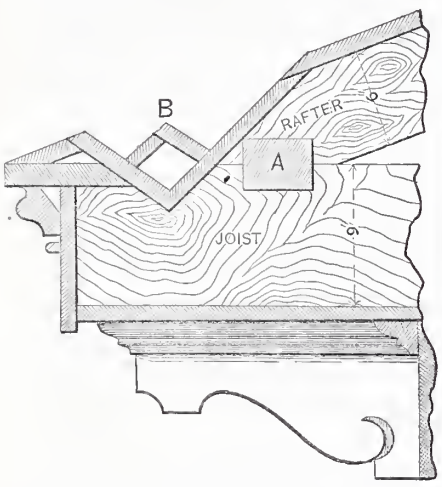



*Floor Plans by "Photo," No. 70.—Scale 1-16th Inch to the Foot*

## CORRESPONDENCE.

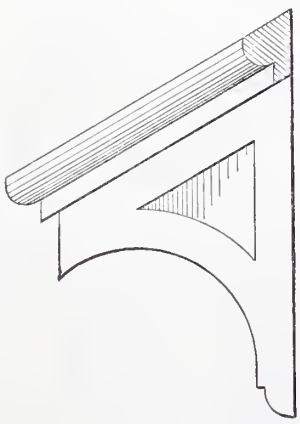
### Formation of Gutters.

*From* A. H., ——— I inclose a sketch of cornice such as I have used in my practice, and find it answers all purposes. The principle is in the inverted V-shaped trough. The same feature might be made round, out of tin, if desired. Rainy weather never taxes the strength of a gutter; it is only when snow falls on the roof and fills the gutter and commences to thaw that trouble is experienced. The snow holds the water in the gutter—it freezes there and bursts the gutter. The object of the inverted trough is to form a space in such a way as to allow the water to run off as fast as the snow melts. The general effect of a gutter constructed in this manner is to hold the snow from the




*Formation of Gutters.—Sketch Accompanying Letter from A. H.*

bottom of the gutter and to allow the water to run away as fast as formed. Nothing remains but the snow to freeze, and that does not affect the gutter. Gutters should never be put in square, as it is almost impossible to prevent their bursting. Secret gutters were not in use in this section of the country until I introduced the inverted trough shown in this sketch. Since this has been employed there has been no trouble with the gutters. Some two years ago I put in a secret gutter made of copper, using a square form. It only lasted, however, a few years. I took it out and put up a hanging gutter. Twelve years ago I built a house for myself and put in a secret gutter after the form shown in the accompanying sketch. It has not leaked in the time named, and has



*Cutting the Moldings of Rake Brackets.—Fig. 1.—Sketch Inclosed by E. J. G.*

never caused any trouble. The inverted trough lies loose in the gutter, it should be understood, so that the water can run under it as it melts.

### Cutting the Moldings of Rake Brackets.

*From* E. J. G., *Seattle, W. T.*—Will you please explain in *Carpentry and Building* how to cut the moldings of rake brackets? The accompanying diagram will illustrate my meaning.

*Answer.*—The equivalent of this question has been presented by other subscribers on different occasions, and we shall endeavor to now answer in a way to meet not only the want above expressed, but those of others at the same time. Fig. 1 of the accompanying engravings represents the

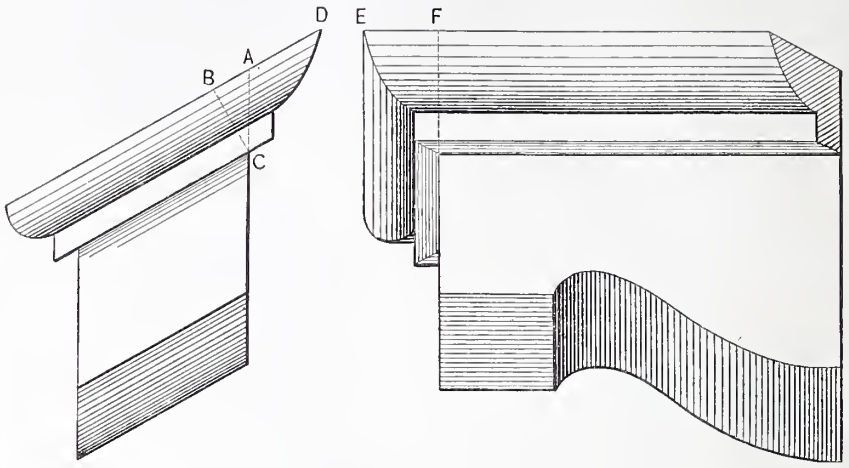



*Fig. 2.—Front and Side View of Bracket, the Method of Cutting the Moldings for which is Shown Below.*

sketch inclosed in our correspondent's letter. We have introduced in Fig. 2 a design somewhat similar to the one just mentioned, but which in its parts and the shape in which it is shown will better serve the purpose of explaining principles and method. Since the shapes are to be cut in an ordinary miter box, we probably serve our correspondents best by showing how the lines are derived from the bracket and how they are applied to the miter box.

Fig. 3 represents a top and end view of a miter box, so constructed as to cut the miters of the molding shown on the face view of

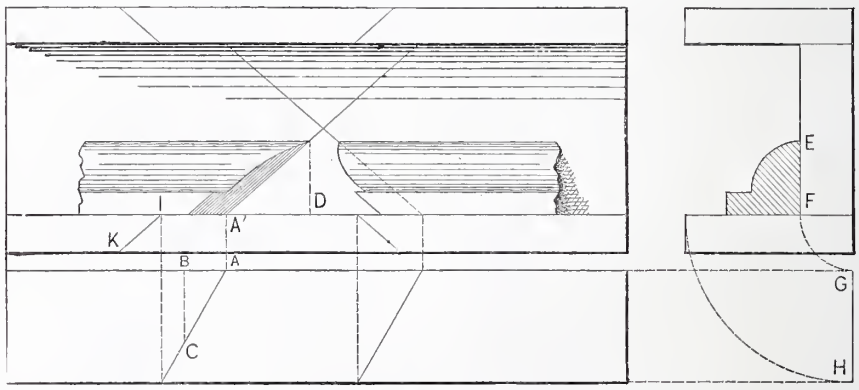



*Fig. 3.—Top View, Cross Section and Diagram of Side of Miter Box Arranged to Cut the Face Molding of Bracket Shown in Fig. 2.*

the bracket in Fig. 2. Below the top view of the miter box is given a diagram of the inner surface of one of its sides, the proper position of which is indicated by the curved lines drawn from the end view. The method of obtaining the saw cuts in the miter box is as follows: The distance A' D, Fig. 3, is made equal to A D, Fig. 2. From the point C, Fig. 2, the line C B is drawn perpendicular to the top line of the molding, and the distance B A, Fig. 3, is then made equal to B A, Fig. 2, and the distance B C, Fig. 3, made equal to B C, Fig. 2. Through the points A and C, Fig. 3, a line is drawn, giving the inclination of the saw in the box. The angle across the box is the same as in any ordinary right-angled miter—that is, 45 degrees. We think the sketches of molding shown in the box illustrate clearly the application of the foregoing. The miters to be cut upon the return pieces on the upper and lower sides of the bracket are ordinary square miters, and may be cut in the ordinary miter box, care being taken that the back of the vertical side of the molding A C, Fig. 2, is kept against the side of the miter box. For greater convenience, the miter box might be provided with a false pitched bottom, the pitch of the bottom being made equal to that of the gable under which the brackets are to go, the sides of the box being kept vertical.

### Roofs in the Eleventh Competition.

*From* F. S. S., *Mount Clemens, Mich.*—I notice by the floor plans forming the basis of the next competition, and which were published in the April number of *Carpentry and Building*, that the kitchen roof is to be hipped and that the pitch of the front-porch roof is also indicated. In designing for this competition, must the architect be governed by the floor plans in these particulars, or may he give the style of roof to the porches and kitchen that in his judgment best suits the style of his design?

*Answer.*—In former competitions we have allowed variations of the kind to which this correspondent refers. The elevations published in the present issue are cases in point. It will be noticed that a variation has been made from the original floor plan in the matter of the roof of the front porch. We see no objection to permitting variations of this kind, but cannot allow them to extend to a change in the actual floor plan of the house in any particular whatever. In drawing the plans, the authors were of necessity obliged to indicate where porches were to come. How these and other portions are to be roofed is really a part of the superstructure, and does not, in our judgment, necessarily belong to the planning or arrangement of the house. Instead of answering this correspondent by mail as he desired, and also others who have proposed the same question, we have replied in print in order to reach the largest number.

### Barn Building.

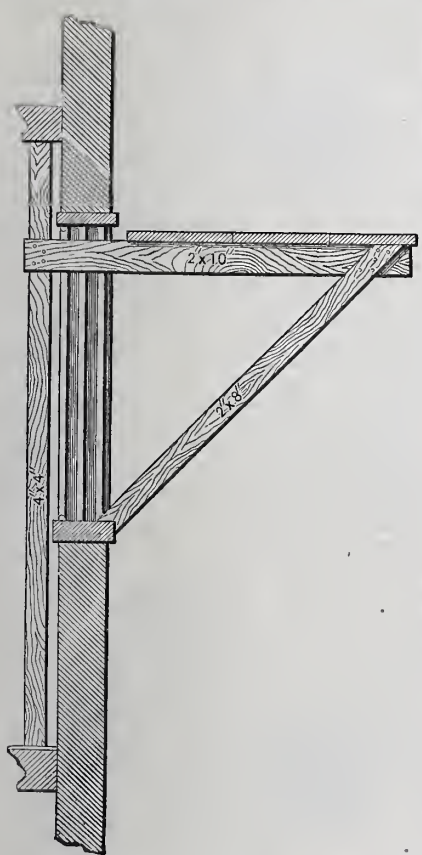
*From* S. E. M., *Cookport, Pa.*—Why should there not be some barn plans, with full directions for erection, published in *Carpentry and Building?* I think they would benefit many readers, especially those who follow that branch of the trade regularly. I have several plans that I would contribute if desired.

*Note.*—Any one who desires to open up in *Carpentry and Building* a discussion of any definite subject, cannot do so by any better

plan than forwarding such contributions as he is prepared to make himself. The publication of them will serve to call out discussion and articles on the same subject from other subscribers. We shall be glad to inspect the the barn plans to which our correspondent refers, and trust that others will contribute also in the same direction.

### Mechanical Expedients.

*From* G. N. C., *Hancock, N. H.*—I think that if some of the old "chips" would give the readers of *Carpentry and Building* a few




*Mechanical Expedients.—Fig.* 1.—*Method of Constructing Staging.*

short sketches of their experience, showing how they get over difficult places, it would be of great interest. To show the sincerity of my intentions I will lead off, and if the idea that I suggest strikes the readers of the paper favorably I trust others will follow. I had occasion last year to repair the roof of a four-story woolen mill. The question of staging was an important one, as there was water on the side of the mill, and there was no room for inside timbering, as the machinery was to be kept running during the time the roof was repaired. A piece of 4 x 4 from floor to ceiling, a horizontal arm 2 x 10 and a brace of 2 x 8 notched on to the stone window sill, all as shown in Fig. 1 of my sketches, together with flooring boards put through the window opening and braced sideways, solved the problem. The openings were covered with canvas or sacking during the time the staging was out. On another occasion I was called on to replace a purlin in an old king-post roof which, owing to a leak in the roof, had become rotten near the brace mortises. I first sawed off the brace tenons and took out the rotten stick; then I framed a new one with a false tenon 12 inches long on one end in an open mortise, putting an iron band ½ x 1½ inches around the end to prevent splitting. The timber was then put into its place and two hardwood keys or wedges driven in, forcing the tenon down into the open mortise. The braces were spiked to the purlin and the job was completed as indicated in Fig. 2 of my sketches, without stopping the machinery directly underneath. Of course, shores were used to hold the roof in position.

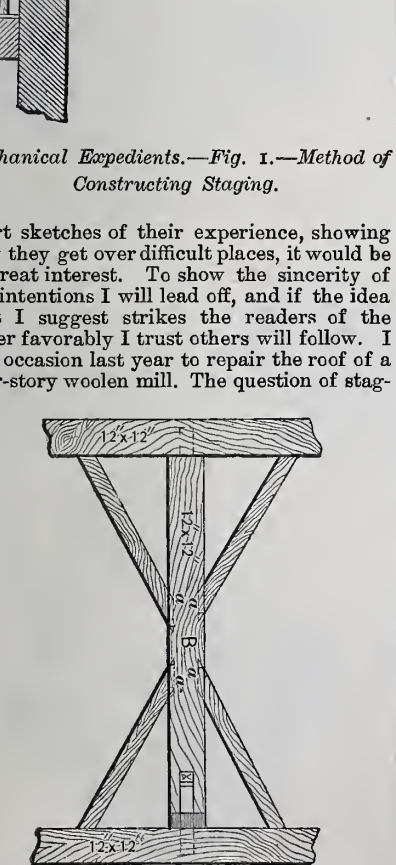
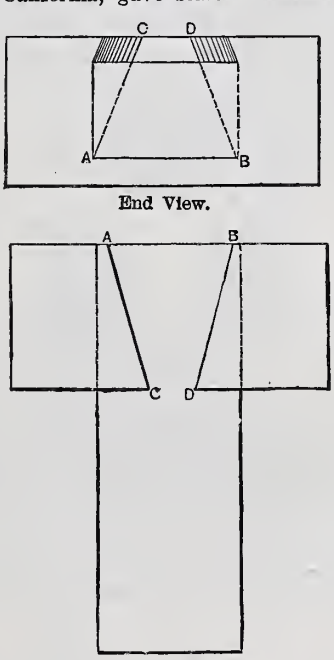



*Fig.* 2.—*Method of Replacing a Purlin in a King-Post Roof.*

### A Puzzle that Puzzles.

*From* E. D. S., *Brattleboro', Vt.*—In the issue of *Carpentry and Building* for May, 1881, your correspondent, "Puzzle," writing from California, gave some illustrations of




*A Puzzle that Puzzles.—Fig.* 1.—*Views Brought Forward from our Issue for May,* 1881.

wooden puzzles which were very cleverly conceived. The one of the cross I should like to have him explain more fully, as I cannot study out how it goes together so as to show a dovetail each way.

*Answer.*—Instead of referring the above to the subscriber who originally contributed the puzzle in question, we will undertake to afford the additional information required. In Fig. 1 of the accompanying engravings we present the top and end view of the puzzle as it was published in the May number of *Carpentry and Building* for 1881. It will be seen that it has the appearance of a double dovetail. This is made plainer by a

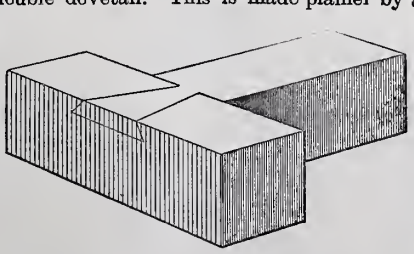


*Fig.* 2.—*A View of the Same Puzzle in Perspective.*

new view of the complete puzzle, which we have had engraved and now present in Fig. 2. How this is accomplished is clearly shown by Figs. 3 and 4, which represent the two parts of which the puzzle is composed. It will be seen that the projecting tongue on the piece shown in Fig. 3, and the corresponding recess in the piece shown in Fig. 4, are cut in a very peculiar manner. A B in Fig. 3 corresponds with A B in Fig. 4, and

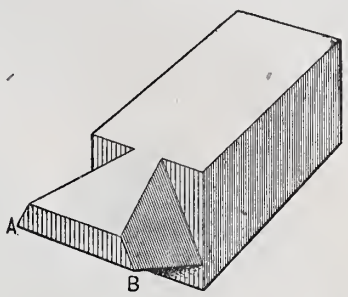



*Fig.* 3.—*Perspective View of the Long Piece.*

the tongue entering the opening in this manner slips up until A′ B′ of Fig. 4 corresponds with A B of Fig. 3. Altogether the puzzle is a very neat one, and if properly executed, cannot fail to create surprise in the minds of those to whom it is presented, until it is fully explained.

### Front Doors.

*From* J. G. H., *Philadelphia, Pa.*—I notice that in New York City, where they build large rows of houses with folding front doors, the door nearest the party wall is made the stationary door. In Philadelphia the contrary practice is the rule. The door nearest the party wall is made the swinging door. The object of this letter is to ask which is right, for it seems to me one or the other must be wrong. It should be understood that right or left hand convenience has nothing to do with this case, nor has the umbrella or hat rack anything to do with it. I mention these matters because, if I do not, some one, in answering the question, will bring them forward as reasons. What I want to know is, Which is the proper way—should the one nearest the party wall be stationary or should it swing?

*Note.*—Accompanying this correspondent's letter is a diagram illustrating his meaning, which we have not considered it necessary to engrave. He shows a partial plan of a row of buildings, the center of the sketch indicating the party wall separating two of

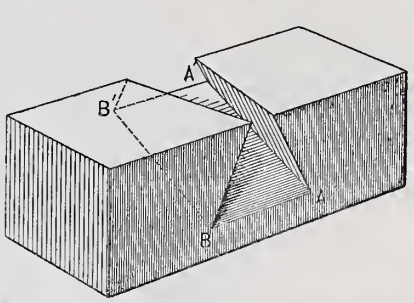
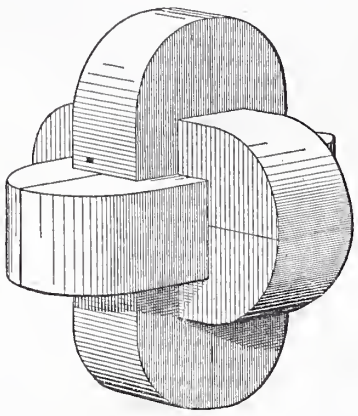



*Fig.* 4.—*Perspective View of the Cross Piece.*

the houses. On one side he shows the door next the party wall as stationary—that is, being bolted top and bottom, while the opposite half, or the portion furthest from the party wall swings and carries the knob and lock. This he marks as the New York style. On the opposite side of the party wall he shows a double door with the half next the same wall swinging, and the half furthest from it bolted or stationary. This he marks "Philadelphia style." We do not think it necessarily follows that either of these plans is wrong. It would seem a curious fact that the practice in the two cities should be opposite, as our correspondent describes. Our impression is that in New York City the custom is not universal, as he would indicate. Matters of this kind, it seems to us, should be determined by individual preferences and actual convenience.

### Another Wooden Puzzle.

*From* K. O. A., *New York.*—In a recent issue I called attention to a somewhat intricate wooden puzzle, and remarked that at some future time I would explain another and more difficult one. In Fig. 1 of the accompauying engravings there is shown the general appearauce of the puzzle referred to, after the parts are put together. In some respects it is not unlike the one to which I have already directed attention. It appears to be interlocked in such a way that it could only be whittled out of one solid piece. A little investigation, however, shows that



*Another Wooden Puzzle.—Fig. 1.—General View of the Complete Puzzle.*

there is a key-piece of the general shape shown in Fig. 2. By slipping this out there is very little difficulty in taking the puzzle to pieces, although it does not fall apart so readily as the one previously explained. After the parts are separated it is a somewhat difficult matter to combine them. Careful inspection shows that the six pieces of which the puzzle is composed are all different, and that there is an unusual amount of locking and interlocking among them as

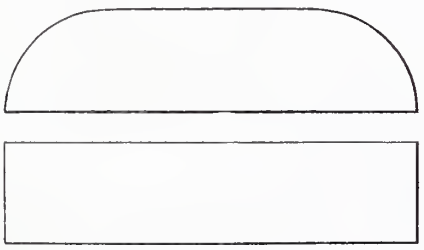


*Fig. 2.—The Key Piece.*

they go together. The parts are shown in Figs. 2 to 7, inclusive. It will be found that two of the pieces—namely, those illustrated in Figs. 3 and 4—are alike, with the exception that they are reverses of each other. The piece shown in Fig. 7 is simpler than the others, being cleat-like in its general form. I have shown the pieces each in two views, so that any reader of *Carpentry and Building* who chooses can whittle out a set.

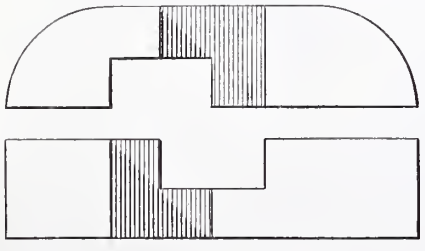


*Fig. 3.—The First Piece to Use in Putting Together.*

The puzzle that I have is exactly the size of the engravings here presented. In combining the parts, the two shown in Figs. 3 and 4 are used first and are placed together in the manner shown in Fig. 8. After these are in position the piece shown in Fig. 5 is laid under and across, bringing the puzzle into the shape shown in Fig. 9. Next the piece shown in Fig. 7 is introduced as shown in Fig. 10, after which Fig. 6 is placed in position, leaving a straight opening through the puzzle to receive the key piece, Fig. 2.

### Farmer's House.

*From* A FARMER'S DAUGHTER, *Orange County, N. Y.*—My sentiments with reference to a farmer's house harmonize perfectly

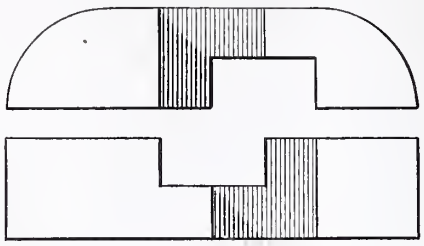


*Fig. 4.—The Second Piece, Shown Upright in Fig. 8.*

with those of J. R., published in a recent number of the paper, save only with respect to the mansard roof. I agree with him on the subject of a house comfortable to live and work in for the families of well-to-do men and women located in towns. If everybody could procure and afford to pay plenty of servants to do, as well as make, work, such houses as "An Architect" is now developing, the serial which for several months has

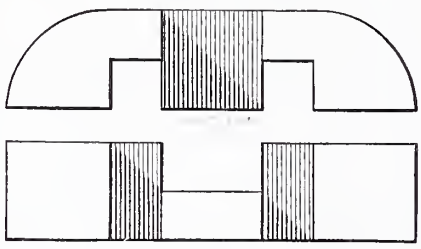


*Fig. 5.—The Third Piece, Shown Horizontal in Fig. 9.*

been running in *Carpentry and Building*, might do, but as it is, deliver me from living or working in such a structure or paying to keep it painted and in repair. I supposed when Mr. Archie commenced his studies he was going to give us a moderate-priced, practical structure, but how he can harmonize the one under consideration with the requirements of people of moderate means I fail to see.

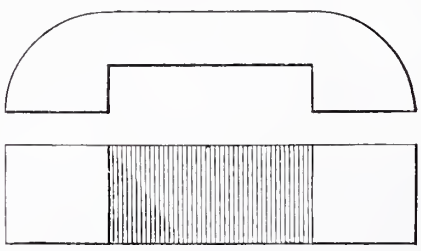


*Fig. 6.—The Fourth Piece, Shown Upright in Fig. 10.*

I was born in a Queen Anne style house, where my father and grandfather together lived for nearly a century, and where their descendants yet live. Its massive stone walls, if left to stand, may give shelter to

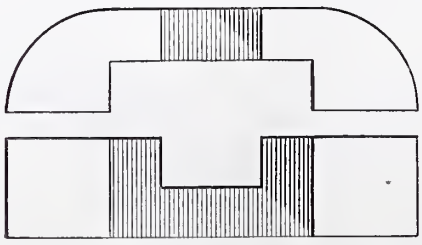


*Fig. 7.—The Fifth Piece, which the Parts as Shown in Fig. 10. are Ready to Receive.*

generations yet unborn. I never fell in love, however, with the style of architecture named, nor do I thiuk the hotch-potch, jim-crack imitations of the present day are to be admired. The grand old structures of pre-revolutionary fame are pleasing in the landscape and are gratifying to one's family pride, but as to the new-fangled imitations of them, I can only say that those who wish to build them of course will do so, but for myself I have other fancies.

It is a wholesome fact that the wives and daughters of many of the well-to-do farmers

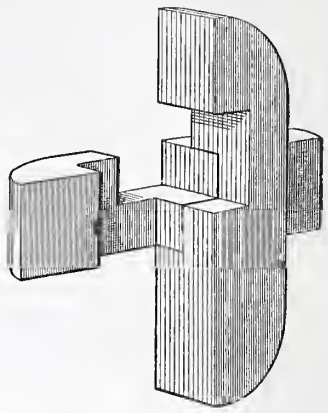


*Fig. 8.—The First Step in Putting Together.*

and townsmen of the present day manage their own housework, being at once cooks, chambermaids and waiters, to their credit be it said. With this fact in view, why would it not be well for *Carpentry and Building* next to take up the development of house plans suitable to meet the wants of

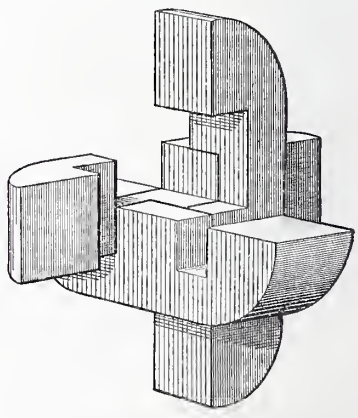


*Fig. 9.—The Second Step.*

this large class in the community. The buildings should be restricted to 10 rooms, all ou two floors, and compact, so as to economize the steps of those doing the housework. The cold, barn-like halls that consume half the buildiugs should be avoided.

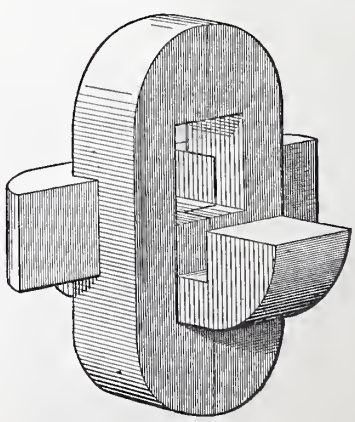


*Fig. 10.—The Third Step.*

The expense should not exceed $6000, and might vary from that figure down as low as $3000. Even well-to-do farmers cannot afford more money than mentioned in a dwelling. Extravagant flights of Queen Anne and Eastlake monstrosities, therefore, must be avoided if the question of cost is of any importance. Let the building be of brick or

concrete, with slate roof. A well lighted attic is very desirable.

I think mansard roofs especially objectionable for country houses, because they require so much tin roofing, which must be frequently painted to keep it in repair, and which makes the roof objectionable for gathering rain-water. Rain-water, when filtered, I think the most desirable water for family use. An observatory of moderate hight and cost is not objectionable, but to put on farm houses tall steeples suitable for churches appears to me simply absurd. The money expended in balconies, bay windows and conservatories is far more sensible. A vital point is that the house should face south, in order that the good housewife may use the cheery sunlight as a noon mark to brighten her home life. If a contest of the character named should be conducted, I shall hope that many women who ought to know well how to plan a house, conveniently arranged for home purposes, will improve the opportunity to present their ideas. Women should certainly take a prominent part in such a competition.

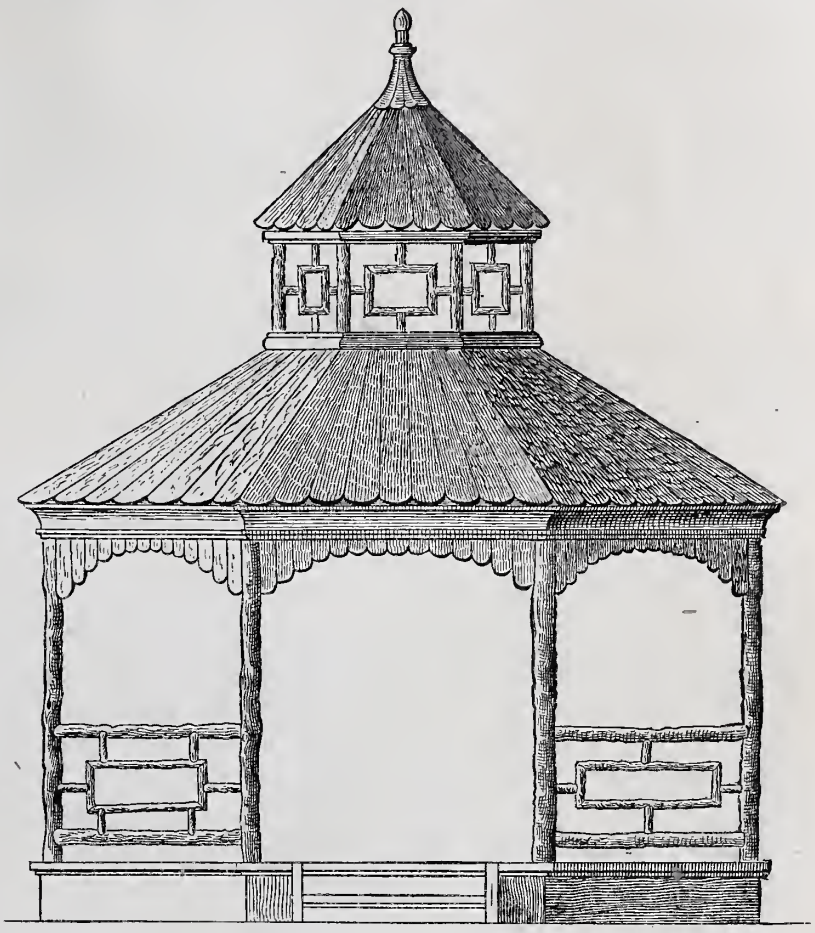
### Use of Formulæ.

*From* F. F., *St. Joseph, Mo.*—I like *Carpentry and Building,* because I believe it to be the best practical work devoid of formulæ that is published, notwithstanding the pretty severe criticisms it passed upon my communication from Grand Island, Neb., about a year ago, in which I deprecated the prevailing fashion among engineers of resorting constantly to the use of algebraic formulæ. As a civil engineer of over 30 years' experience, and superintendent of bridges and buildings, I know it to be a fact that the majority of engineers, in order to avail themselves of algebraic formulation, are constantly compelled to "brush up" their mathematics. Trautwine, in his work, generally acknowledged as the corner-stone of an engineer's library, makes no truer statement than the following: "Nearly all the scientific principles which constitute the foundation of civil engineering are susceptible of complete and satisfactory explanation to any person who really possesses only so much elementary knowledge of arithmetic and natural philosophy as is supposed to be taught to boys of 12 or 14 years in our public schools"

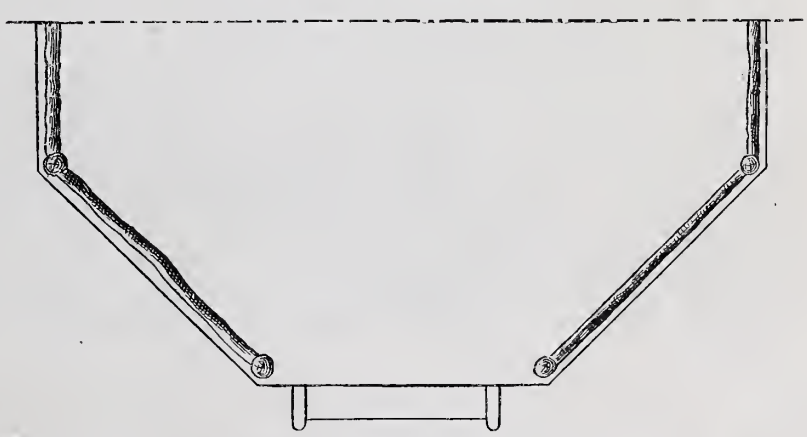
*Note.*—We do not think that our criticism upon our correspondent's communication of last year was either harsh or unjust. On the contrary, reference to our files will show that it was, if anything, complimentary, notwithstanding the fact that we took decided exception to his wholesale condemnation of the use of algebraic formulæ. While, out of deference to our readers, we for the most part avoid the use of formulæ, our position on this question is unaltered. We still hold that algebraic formulæ are simply a condensed mode of expression—an improved and very convenient tool in the hands of those who know how to use it—nothing more nor less. As for F. F.'s quotation from Trautwine's preface, we will say that others have quoted it before, and coming generations of lazy school-boys will continue to quote it. With all due respect to Mr. Trautwine, we think that his hand-book would lose none of its practical value if it were published without this preface. The sentence quoted is simply a truism the utterance of which has has done a great deal of mischief by the misinterpretations it has received. "Nearly all the scientific principles" (but not quite all) "which constitute the foundation of civil engineering are susceptible of being satisfactorily explained" to a mere schoolboy, says Mr. Trautwine. But so are the fundamental principles of any other science; yet this does not prove the superfluity of scientific training in the practice of a profession. Mr. Trautwine, by way of demmonstrating a truism (which needs no demonstration), shows how the principle of the lever, of the equality of moments, of virtual velocity, are all involved and illustrated by two boys playing see-saw over a fence rail. He further dwells upon the fact that the boys could thus be made to acquire these scientific principles "while at play—and without spanking or keeping-in," but says nothing of the "spanking" and "keeping-in" they got for see-sawing at all in the first place, and the subsequent second spanking that followed upon their mothers' discovering that the modified paternal breeches needed "mending again." In the same way it might be shown that any boy who remembers his first experience at playing "snapping the whip," or his last tumble out of an apple tree, has already acquired the two fundamental principles that underlie the whole science of astronomy. All this has thus far not made our boy an accomplished astronomer any more than Mr. Trautwine's two see-sawing boys need necessarily turn up as accomplished engineers. Neither does Mr. Trautwine desire to be so understood, as is plainly shown by the following quotation, taken from the very next page of this same preface: "It is the ignorance of these principles, so easily taught even to children, which constitutes what is popularly called 'the Practical Engineer,' which, in the great majority of cases, means simply an ignoramus who blunders along without knowing any other reason for what he does than that he has seen it done so before. And it is this same ignorance that causes employers to prefer this practical man to one who is conversant with principles. * * * * They turn up their noses at science, not dreaming that the word means simply *knowing why.*"

### Rustic Arbor.

*From* W. H. C., *Rougemont, P. Q.*—I inclose a plan of rustic arbor, in answer to the inquiry of J. H. A., of Wilkesbarre, Pa. The design is all that is required, and the construction is such that any one will readily comprehend it. I trust it will prove of service to him. The arbor represented was built last summer of ash with the bark on. The roof was covered rough in hemlock and then covered with ash slabs.



Elevation.—Scale, ¼ Inch to the Foot.



Plan.

*Design for Rustic Arbor, Contributed by W. H. C.*

### Nickel-Plated Screws.

*From* S., *Olathe, Kan.*—Will you please inform me where I can get a screw with a round head, silver or nickel-plated? I want such as are used in finishing casings of walnut for windows and doors of cars and the like.

*Answer.*—Inquiry in the trade produces the information that screws of this kind, although formerly kept in stock, are not now regularly carried by dealers in hardware. The great variety of sizes and kinds, to say

nothing of the different styles in which they can be plated and the deterioration from loss of luster, &c., when carried in stock, have prevented trade in goods of this kind being profitable. We learn that it is the present practice to have the screws plated to order, which can be done at comparatively small cost by any plating establishment, leaving the selection of the kind of screw, character of plating &c., to the one who is to use them. If our correspondent is near to any plating works, he will have no difficulty in acting upon this suggestion. If he is not convenient to such an establishment, a good plan will be to correspond with some concern doing work of this kind in a large city, in which the plater could buy the screws required, plate them and ship them in finished condition. All it would be necessary for our correspondent to do would be to furnish a sample of the screw as to size, kind of head, &c., with directions with reference to the plating required. We can furnish the names of firms doing plating work of this kind should our correspondent desire

### Spiral Screw-Driver.

*From* CHARLES MANN, 2348 *Third Avenue, New York.*—I notice in a recent number of *Carpentry and Building* an inquiry for a spiral screw-driver. As being of interest to the many readers of the paper, I beg to inform them that I keep the screw-driver named in stock, and am prepared to send it by mail.

### Width of Cornice.

*From* S. E. M., *Cookport, Pa.*—In answer to M. T., of Dorchester, whose inquiry was published recently, I would say that there is no rule to govern the width of cornices, it being simply a matter of taste. The cornice should be made to suit the style and purpose of the building.

### Designating Feet and Inches.

*From* V., *Canandaigua, N. Y.*—Webster's Unabridged Dictionary, which is considered good authority in this part of the country, gives, among others, the following definition of "accent:" "A mark used to denote feet and inches, as 6′ 10″ is 6 feet 10 inches."

### Brazing Band-Saws.

*From* H. M. B., *Phelps, N. Y.*—On page 51 of the March issue of *Carpentry and Building* there was described a way of brazing a band-saw, in which was mentioned an alloy of copper and silver to be used in the operation. I have a broken saw, and would like some of the alloy described. As I do not know where to send for it, I venture to ask for the information through the columns of the paper.

*Answer.*—The article to which our correspondent refers was taken from an English paper, and though the author does not call it by that name, we are under the impression that what he refers to is the same as is ordinarily known in this country as silver solder. This is largely used in similar operations by manufacturers. Our correspondent will have no difficulty in obtaining what he requires for the purpose, together with the large tongs described by this writer, and all necessary appliances, by corresponding with any of the manufacturers of band-sawing machines. As being likely to afford him the information he needs, we suggest his writing to Frank & Co., Buffalo, N. Y.; F. H. Clement, Rochester, N. Y.; London, Berry & Orton, Philadelphia, Pa., or J. A. Fay & Co., Cincinnati, Ohio.

### An Extension Ladder.

*From* J. McF., *North Woburn, Mass.*—Will some practical reader of *Carpentry and Building* furnish instructions for making a light extension ladder? I want something from 30 to 40 feet in length, strong, and suitable for carpenters' and painters' use.

*Note.*—This question was considered by some of our contributors some time since, and, as being of interest to this correspondent, we refer him to page 76 of our issue for April, 1882.

## REFERRED TO OUR READERS.

### Omission of Chimneys.

*From* H. T. L., *Rockland, Mich.*—I would like to ask the author of the design published on pages 70 and 71 of the April issue of *Carpentry and Building* what he has done with the parlor and kitchen chimneys, that they do not show in the front and side elevations. He has got them all right on the roof plan. Does he think that if they were shown in the elevations they would spoil the symmetrical appearance of his effort?

### Lime Coating for Old Shingles.

*From* J. A., *Nantucket, Mass.*—I am desirous of finding the best ingredient to mix with lime for making a good coating for old shingles, boards, &c., for outside work. If some one can give me the desired information he will confer a favor.

### Close Valleys.

*From* G. F. B., *Gilfillin, Kan.*—I desire to learn from some of the practical readers of *Carpentry and Building* a method of shingling valleys in a roof of half pitch without using valley tin.

### Mantel Cabinet.

*From* G. E. S., *New York City, N. Y.*—I should like to see published in *Carpentry and Building* a design for a mantel cabinet suitable for execution in cherry or mahogany. In general character it should be appropriate for a back parlor the hight of ceiling of which is 11 feet.

### Address Wanted.

Mr. Charles E. Willoughby, Perth Amboy, N. J., the author of the plans published in a recent issue of this paper, desires the address of a correspondent from Tallahassee, Fla., who wrote him concerning his designs. Mr. Willoughby informs us that his correspondent omitted signing his name or giving any address by which he could reach him. He takes this means of obtaining what will enable him to answer the inquiries addressed to him.

### Space for Plowing a Window Jamb.

*From* A. B. K., *Ottawa City, Iowa.*—I desire to ask the readers of *Carpentry and Building* the correct amount of space to allow for plowing a window jamb for 1⅜ sash, so that the window, in working, will slide freely.

## STRAY CHIPS.

THE CONTRACT for building the State Lunatic Asylum at Columbia, S. C., has been awarded to Mr. R. M. Johnson, the amount being $46,500.

THE Court Street Methodist Episcopal Church, of Flint, Mich., has adopted plans for a new building capable of seating 800 persons. The structure will cost, when completed, $10,500.

A BLOCK of stores are now in progress of erection at Medina, N. Y. The front will be of brick, with side walls of stone. Messrs. Standeven & Gledhill have the contract for the carpenter work.

At Stephens Point, Wis., the Odd Fellows are about putting up a brick building, 47 x 70 feet, and two stories high. The first floor will be used for store purposes, while the upper floor will be used for a hall.

MR. GEORGE RUST is erecting a two-story brick residence on Lincoln avenue, between East Seventeenth and East Eighteenth streets, Dever, Col. The building is 45 x 60 feet in plan, and will cost $10,000. Mr. M. Kinzie is the architect and builder.

THE NEW YORK, WEST SHORE AND BUFFALO RAILWAY CO. are erecting at Syracuse, N. Y., a large freight depot, the contract for which was awarded to Messrs. Baker & McAlester. The same road are also putting up a passenger station, the contract price of which is $83,000.

THE GERMANIA SOCIETY, of New Tacoma, W. T., think of erecting a hall. The plans contemplate a two-story edifice, 60 x 100 feet, the lower floor of which will be used for a German-English school, with gymnasium, library and employment office for immigrants and others. On the upper floor will be a large hall for public meetings, balls, &c.

MR. J. C. REICHERT, of Tipton, Iowa, is about to erect a fine residence in the Queen Anne style. The building will be fitted throughout with water, Messrs. Geo. Kendall & Co., of Clinton, Iowa, doing the plumbing. The building is to be frame, and will cost, when completed, about $8000. The plans and specifications were drawn by Mr. S. B. Reid, of New York City.

MR. WILLIAM QUAYLE, of Denver, Col., is the architect for a business block that is going up on Lannier street, between Twenty-first and Twenty-second streets, in that city, for Messrs. L. A. Melbourne & Co. The structure is 50 x 125 feet, and three stories and basement in hight. It is estimated to cost $23,000. Messrs. Halleck & Howard are the builders.

WE ARE indebted to Mr. S. Ott, of Aiken, S. C., for a photograph of a brick school building recently erected in that place, to drawings prepared by him, for the Schofield Normal and Industrial School. The building is 65 x 60 feet in plan, and has been built for solidity and practical use. There are six rooms on the first floor and three on the second floor, besides an assembly room of 30 x 63 feet. The school is one for colored children, and enjoys a fine reputation. The photograph which Mr. Ott has sent us represents the building after completion, with a large number of the pupils, together with their teachers, assembled in the front of the building.

THE ST. LOUIS Music Hall and Exposition Association, having secured subscriptions to the full amount desired, have appointed a committee to procure plans for the new building. They have instituted a limited competition and have made liberal offers of prizes to reward the architects who give their attention to this enterprise. The size of the building is to be 320 x 480. It is to have a large music hall capable of seating 5000 people, a small hall to seat 1200 persons, a fine art gallery for pictures and statuary, bronzes, basso relievos, antiques, &c.; a floral hall or conservatory for plants, flowers and shrubbery, and exhibition rooms for heavy machinery, for manufactures of all kinds, for textile fabrics, &c. It is expected that the building alone, exclusive of the site, will cost $400,000.

THERE HAS recently been commenced on the northwest corner of Judiciary Square, Washington, D. C., a structure that is designed to be occupied by the Pension Bureau. It is 42 feet wide and covers the outside of a rectangular space extending 400 feet from east to west and 200 feet from north to south. It will be 75 feet in hight and divided into three stories. The interior space between the walls forms a large covered courtyard or inside hall, 116 x 316 feet in size. This courtyard will be covered with an iron roof rising at both ends above the walls, the center being crowned with a turret-like structure. The sides of the roof will be of glass to admit light. Two tiers of galleries will run around this hall, by which access is gained to the rooms. The latter occupy the entire width of each side of the building, thus being open to light and air on two sides. The outer walls will be faced with pressed brick laid in red mortar and decorated with moldings and sculpture in terra-cotta. The windows, cornices and the general architectural design of the building is Roman. A pleasing and novel feature will be a course of terra-cotta that marks the first story, consisting of a band 3 feet wide running entirely around the building and representing sculptured figures by the various scenes and incidents in the soldier's life. All the staircases and floors will be of brick, and the galleries around the central hall of brick masonry resting on brick arches and supported by cast-iron columns. The building will afford ample accommodation for 1600 clerks. Gen. M. C. Meigs is the supervising architect. The cost of the structure is not to exceed $400,000. Congress has already appropriated $250,000 with which to begin the work.

ACCORDING to the report of the Inspector of Buildings of the city of Boston, Mass., for the year 1882, there were 235 permits granted for brick, stone and iron buildings; 838 permits for wooden buildings; 23 special permits for wooden buildings within the building limits, and 2205 permits for additions, alterations and repairs. There were 238 brick buildings completed during the year at an estimated cost of $4,932,640, on which final reports were rendered; of wooden buildings, there were 788 completed at a cost of $2,379,278, and 2263 additions, alterations and repairs were made at a cost of $1,607,051.

A NEW union depot has long been needed at St. Louis. The present Union Depot is only about eight years old and was considered ample in size for all demands when first built. But the railway interests have increased so rapidly since then, especially in what are called the Gould system, that the depot has already become much too small. The railway officials have been securing land for the new structure and now declare that they have all they need, and will soon undertake the erection of a new union depot, which shall be adequate to the requirements of the present and immediate future. It is said that there are more railroads centering in the St. Louis Union Depot than in any other in the world.

MR. CALVIN BRONSON, of Toledo, Ohio, is putting up on the southwest corner of Summit and Adams streets, in that city, a business block, 40 x 114 feet in size, with two stories and basement. The front of the edifice will be somewhat imposing in character, it being the intention of the owner to carry it up something over 40 feet in hight. The material used in the construction of the building is plain brick. The cost is estimated at from $12,000 to $15,000.

MR. LAWRENCE SANDS has lately commenced the erection of a private residence on Meridian Hill, in the vicinity of Nineteenth street, Washington, D. C. The building will be constructed of wood, two stories and an attic in hight. A spacious veranda runs along the entire front of the house. The facing of the second story will be shingled and broken at one end by a balcony. On the east side a bay window will extend to the top of the house and terminate in a tower. The interior will be finished in hard wood. The cost is estimated at about $10,000. Messrs. Gray & Page are the architects.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=JULY, 1883. NUMBER 7

## A Study in Suburban Architecture.*

BY AN ARCHITECT.

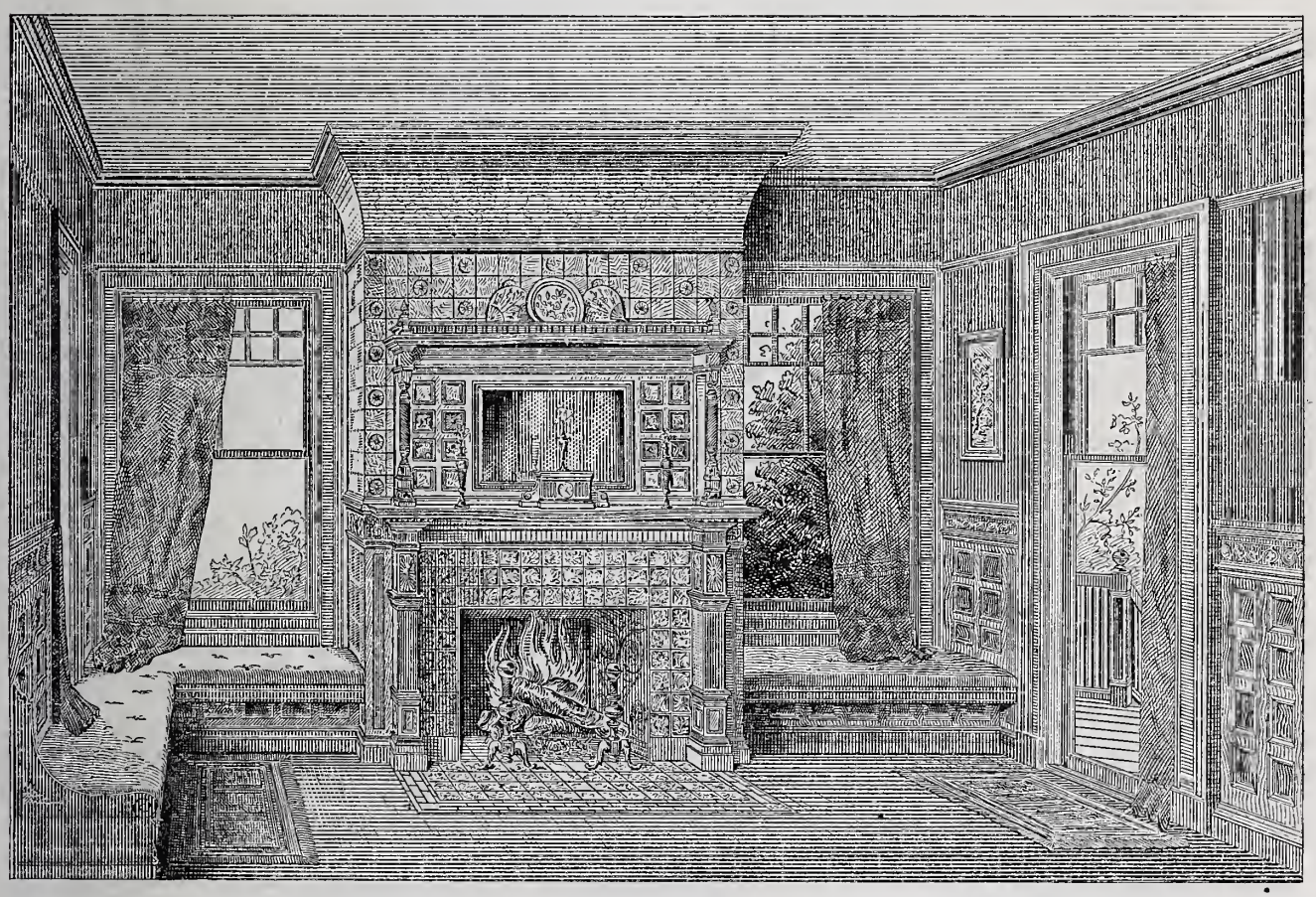
### The Sitting-Room.

This is the room in which we shall spend the greater part of our time when at home. It should be a large room, that each member of the family may have his own chair and favorite corner. We think it should be an irregular room—a room of many corners—for the irregular room is the best room to furnish. If we must have rooms that are square, grand and stately, let them not include our living-room. We must have a corner for our cabinet, wall space for our upright piano, and a place for the open fireplace that is out of the line of travel, in order that the family circle may not be intruded upon. With this object in view, as well as the desire to avail ourselves of the beautiful prospect to the south and east, we have planned our sitting-room with the corner bay, or chimney alcove, which is the subject of our illustration.

It has been decided to finish this room in mahogany, in a plain and simple manner, depending upon the richness of the wood, supplemented by the wall and ceiling decorations, rather than in elaborate detail, for effect. The line of ornament in the frieze of the wainscoting will be done in Lincrusta-Walton finished in bronze. The room is overlighted, and therefore will not lose its cheerful look if treated to a dark, rich paper of the tapestry order—a paper with an intermingling of dull reds, peacock-blue and yellow-brown, in small and uncertain pattern.

Although the illustration provides for a deep frieze, it would be well to place a black picture molding within a few inches of the cornice (which, by the way, is to be of mahogany), the interval to be filled with a plain dull-blue flock; or the frieze space, as represented, can be filled with a brown alligator flock, in which we might hang small plaques and casts in *bas-relief*. There being so little room for paper on the chimney-piece, it is thought best to make it entirely of wood. For this purpose small squares of mahogany are used in a basket pattern, the effect being accomplished by the joints and the different directions given to the grain. The carpet will be dark, quiet in tone, the field a very small pattern, and the border—for borders we like with all carpets—very broad and rich in color. Silk Turcoman, in broad bands of color matching the paper and carpets, is desirable for drapery. The furniture in this room should be upholstered in leather, and every chair will be an easy-chair—broad, low and comfortable.

And now a word again with our critics. To Archie, of Birmingham, we must say that he is exceedingly sharp and pithy in his remarks. Pithy, as far as talk goes, but not always well backed up, nor as strong as his words sound. The noise is often like the rush of wind. His evident intent is to bother his opponent, rather than to search deep enough to really find the points on which his pen might skip with more decided success. If the subject in hand was not nearly a counterpart of our everyday experience, we should feel somewhat alarmed at Birmingham. But what one has done, and found successful, he is quite sure to be firm enough to believe is right. This will suffice to cover several of the points brought up by Archie, of Birmingham, to argue which, we fear, would be a waste of time and space, since he is bound to worry with them for some time to come. He does not seem to understand our explanation of hights. We said that the floor of the summer-house was 2 feet above the lawn. This corresponds exactly with the three risers and the 24 inches which Birmingham mentions. There are no 18 inches remaining to be jumped. Look it over again, please! We found out the distance of the railroad in the last letter, in the passage which says that it is "within sight and sound." If remotely within sight and sound—say about 15 miles—the clatter will not be troublesome. We had rather admit the stable-yard to be a "misnomer" than to believe it a mismanaged and altogether offensive inclosure. We can see other ways to escape the carriageway except placing our house directly in the street line, but don't want to avoid this same carriageway. Our Birmingham critic



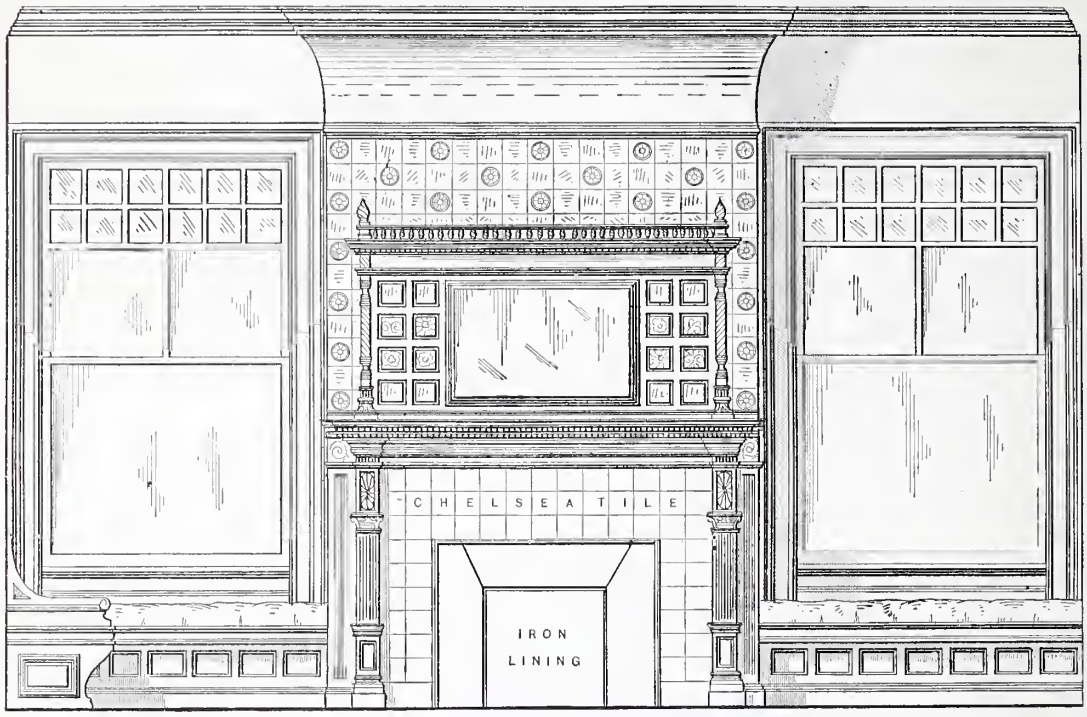
A STUDY IN SUBURBAN ARCHITECTURE.—THE SITTING-ROOM.

* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.

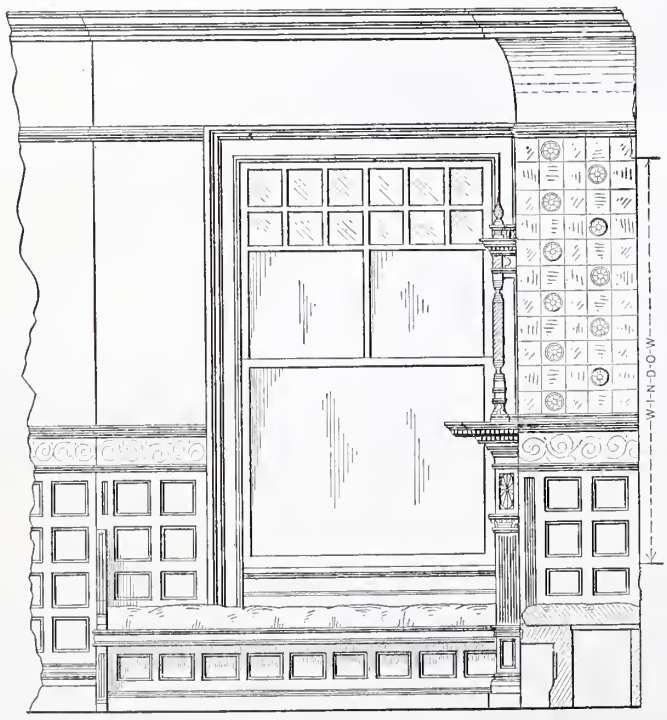
said it would be dusty, and we said "concrete," and, if thou dusty, turn on the wator and wet it down. But Birmingham, with his usual sharpness (which perhaps is a "misuomer"), says "asphalt." Thank you, dear B., but what made you think we intended to use other than "asphalt"? We want to recall our critic to the fact that this point of the argument grew out of his intimation that a carriage porch would keep out mud and dust, and beg him not to wander from the point, but explain his meaning. Perhaps he will think it quite unfair of us to keep up this argument so long, when we might have referred to the plat of lot published in the February number, which has a walk indicated that is not included in the drive-way, thereby allowing the pedestrian to approach the house without using the driveway, and without soiling his boots more than he would in crossing the street. We do not mention this in order to call out any more remarks in this direction, but merely to illustrate the fact that our critic has taken the opposite side of the question for the fun of the thing, and not because he had studied it out. Another proof of this is his way of understanding our method of heating, which we will explain again after a while if he really fails to find it out by the plan and text of the February number.

We will admit that we made an unnecessary thrust in picking up the *porte-cochère*, and ask to be forgiven. The intimation upon the part of our critic, that it was an "unknown quantity," quite unnerved us for the moment, and we were as saucy a: he was. Yes, you may dare say "*portiere*," but don't dare say that it will cut off the light from our upper hall, for in the daytime we will keep it drawn back, and in the evening, which is the only time we shall have to occupy the study, we will have it closed if we wish to be alone. We still think that Birmingham did overlook the hall window to which we refer. He is about right in regard to the croquet mallets, although we could keep them under the steps. With reference to the incline of the drive into Station street, it would descend gradually to the sidewalk line before leaving the yard. The parallel of the column and the coping is unjust. The hight, 1 foot 6 inches, is from the top of the coping to the sidewalk line at the corner of the street. The lawn is nearly level with the top of the coping on the inside. We do not think that any programme should have been called for, saying whether or no the summer-house should be used for a smoking-room. If our critic cares to look back to the February number, he will find that we spoke of the summer-house as "forming a pleasing corner," and as having a good outlook above the street, and as Bob, Mike or Tom will not possibly puff up and down Station street at all hours of the day, we shall perhaps find time to enjoy the view from that point occasionally with or without smoke. And to still continue the stabs in this direction, we would venture the information that if we felt like throwing mud, as Birmingham does, we would be just mean enough to turn aside from the direct argument to say that probably he never enjoys the *tête-a-tête* because of the jealous watchfulness of Mrs. B., and therefore thinks that others have the same B buzzing in their ears. But we won't say anything of the kind—there is too much forgiveness in our nature.

We did not cut in a 2 x 6 inch girt, because we think it better to straighten the sides of the building with a 4 x 5, framing the top of the studding into the same, which keeps them from twisting; and, as the studding of one story does not run into the other, we are always at liberty to frame an opening at any point, whether over another opening or not, which, in the style of house under consideration, is often done. In short, we do not "enthuse" on balloon framing. In conclusion, we wish to free our critic's mind of the fear that we are feeling badly about the style of his language. We like it. We agree with him that one has to make new conditions in order to keep up with him, simply because he makes the present condition of things what they are not. We don't know anything about the dairy farm, and even in the April paper we don't say that we have one, or are going to have one.




*A Study in Suburban Architecture.—Elevation of End of Room Opposite Hall Door.—Scale, ⅜ Inch to the Foot.*



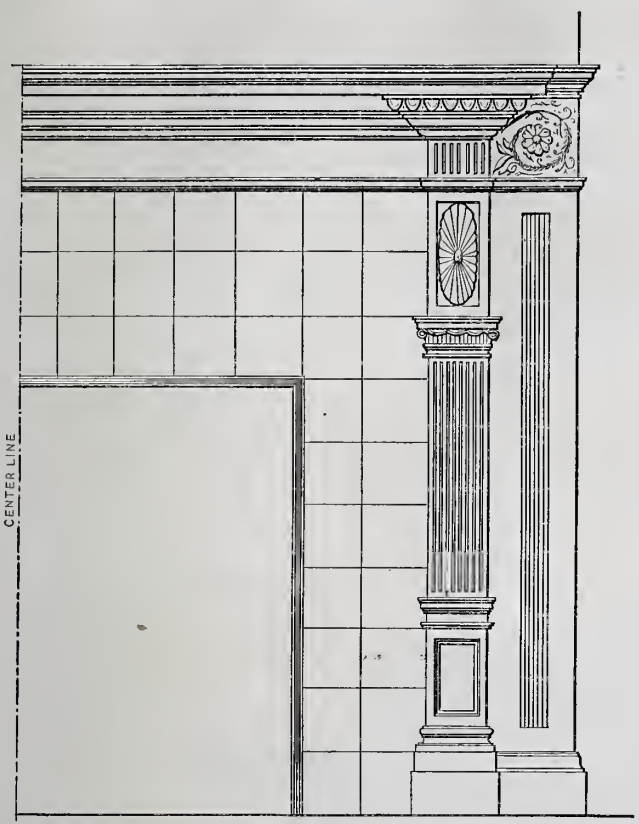

*Part Elevation of Side of Room Opposite Veranda Window.—Scale, ⅜ Inch to the Foot.*

## NEW PUBLICATIONS.

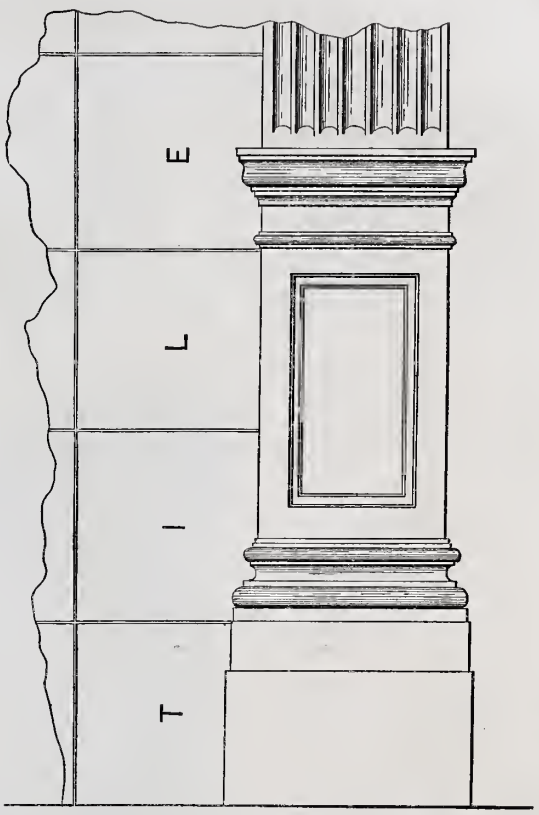
AMES'S HAND-BOOK OF ARTISTIC PENMANSHIP. Published by Daniel T. Ames. Oblong; paper, 75 cents; cloth, $1.

The editor and publisher of the *Penman's Art Journal*, a periodical that has gained wide circulation among those who are lovers

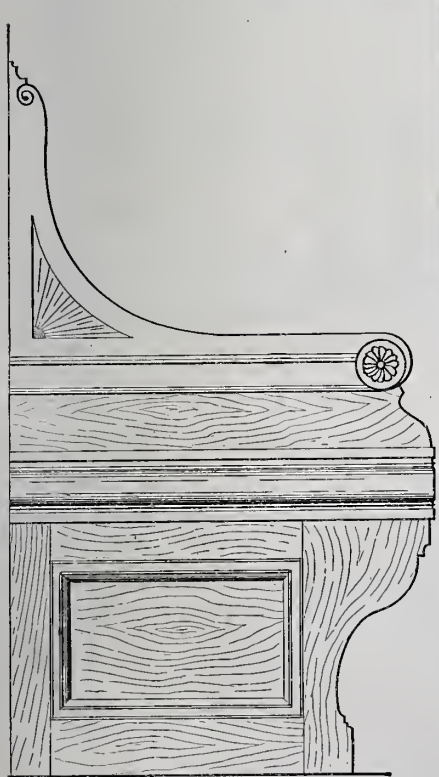
of fine penmanship, has recently issued a neat little manual bearing the above name. It is handsomely printed on paper well adapted for a display of the script alphabets, flourishes, fancy pieces, &c., in which the book abounds. The introduction treats of materials adapted to fine, artistic penwork, and contains instructions that are of value to those who give attention to the art of chirography. Hints on design follow, succeeding which is the body of the book proper. The first illustration represents a penman seated at his table, and illustrates the position of hands and pen, relative to the table and paper, for flourishing. Nearly 30 full-page plates are devoted to various examples of scrolls and flourishes, together with alphabets that are presented in such a way as to make the book useful as a copy-book, if for no better purpose. Several plates are devoted to alphabets specially adapted for marking goods and packages. This department of the penman's art is one which heretofore has received very little attention; accordingly, this presentation of the matter cannot fail to be of interest to a large class in every community.




*Half Elevation of Mantel.—Scale, 1 Inch to the Foot.*




*Detail of Mantel Pilaster.—Scale, 3 Inches to the Foot.*



*Finish of End of Seat.—Scale, 1½ Inches to the Foot.*

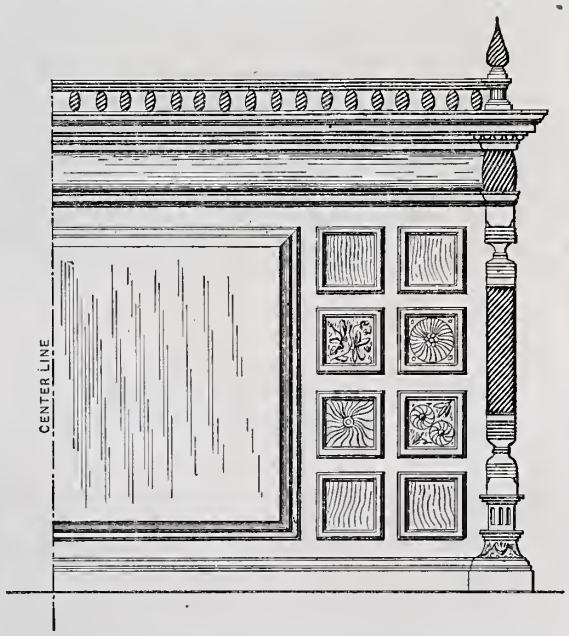
CAMERON'S PLASTERERS' MANUAL. Revised Edition. By K. Cameron. Published by William T. Comstock. Price, 75 cents.

The original edition of this work appeared some four years since, and was very favorably received by the trade at large, partly, no doubt, from the fact that it was a pioneer book in a department of building knowledge that is of great importance. It was also favorably received because of its practical common sense and the straightforward way in which directions were given. The revised edition contains all that was in the original book, with certain misprints and omissions corrected. New illustrations have been introduced and additional recipes given. A new chapter has been added, the general subject of which is practical suggestions and precautions. In this last chapter one of the topics treated is cracks in plastering, in which the causes of cracks are clearly pointed out and remedies are suggested. Another subject considered is the crumbling and falling off of plastering. A form of contract is contained in the book, thus making it of value both in the matter of estimating, performing the work, and in the business arrangement existing between the parties concerned.

**Floor Surfaces**.—There are many ways of treating the floor surfaces of a room, either in part or entirely, so as to avoid the necessity of carpeting the whole surface. The cheapest way is to paint, say a margin of 2 or 3 feet wide, all round the room, in four or five coats of dark color, care being taken that the groundwork throughout is dark, so that scratches shall not show any light color underneath, and that sufficient time is allowed for each succeeding coat to dry and harden. Take care that the floors are painted before being sized, for if the size is used before the paint or stain, the surface will easily chip and become shabby. A square carpet or rug can then be pinned down over the center space, and this can be easily taken up once a week and shaken.

## Reinforced Beton Construction.

Preliminary to giving an account of a building that embodies a radical departure from conservative ideas of building construction, it may be desirable to define a term that will be frequently met with in the description. Béton and concrete, by modern usage, are almost synonymous terms. According to Gilmore, whose "Treatise on Limes, Hydraulic



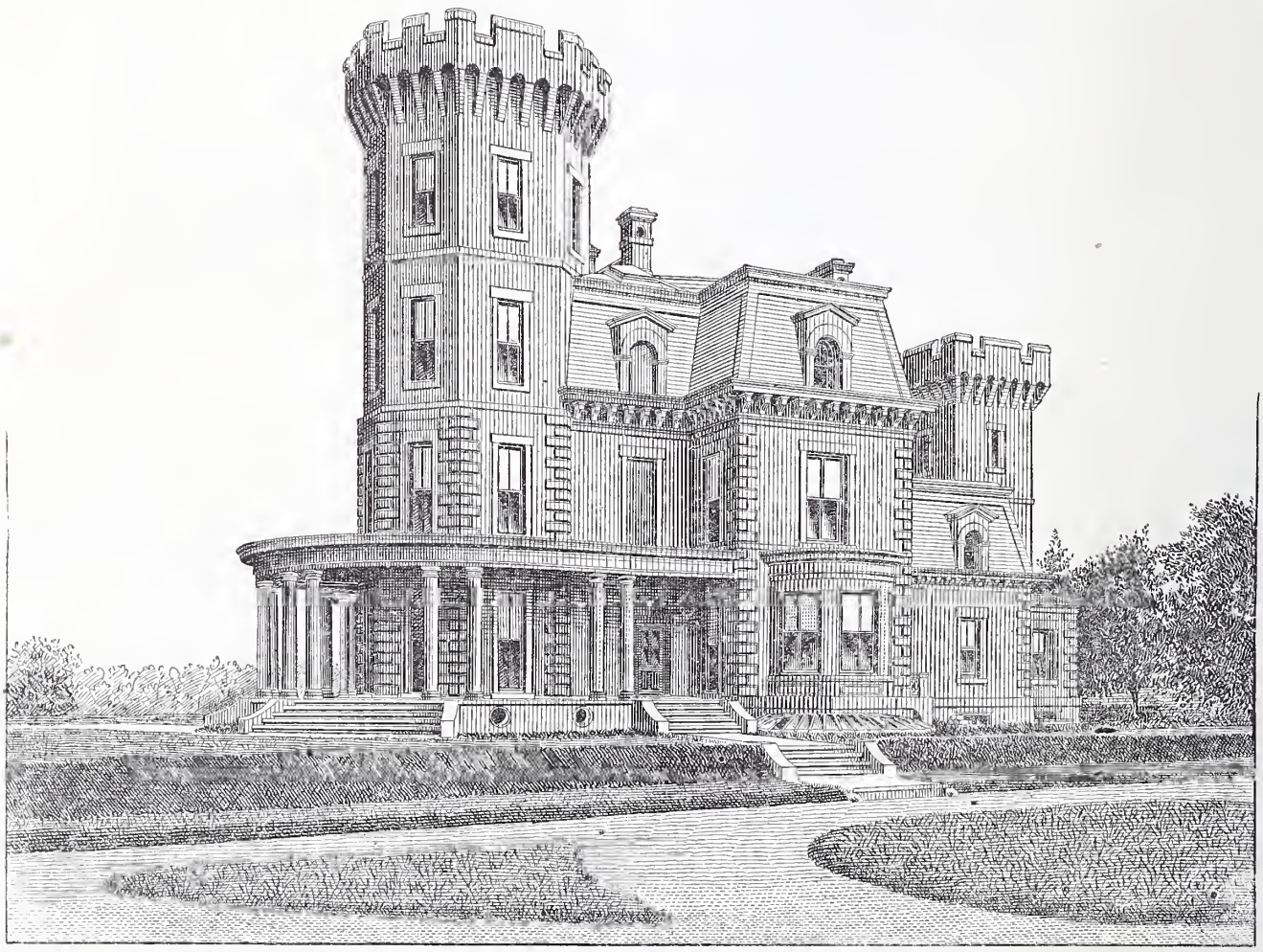

*Half Elevation of Mirror and Frame Over Mantel.—Scale, 1 Inch to the Foot.*

Cements and Mortars" is regarded as good authority, these terms, as generally understood in modern practice, apply to any mixture of mortar, generally hydraulic, with coarse materials, such as gravel, pebbles, shells or fragments of tile, brick or stone. Two or more of these materials, or even all of them, may be used together. More strictly speaking, however, and as originally accepted, the matrix or gang of béton possesses hydraulic energy, while that of concrete does not. It is well to bear in mind this distinction in considering the plan of construction here presented, in which béton composed as explained below was employed.

Many of our readers may have noticed that cement adheres very firmly to tools and pieces of iron upon which it may have been allowed to set. An instance of this kind which came under the notice of Mr. W. E. Ward, of Port Chester, N. Y., some years since, led him to experiments which finally culminated in the construction of a house, a general view of which is presented in Fig. 1 of our engravings. The cut is from a photograph, and the details are from drawings accompanying a paper presented by Mr. Ward at the recent meeting of the American Society of Mechanical Engineers. The title of the paper was "Béton in Combination with Iron as a Building Material." Leaving out many of the details in Mr. Ward's description of this building, solely on account of the pressure upon our columns, for all of them are of interest to architects and builders generally, we shall endeavor, in the space that we can devote to this subject, to give an intelligent idea of the method of construction employed and the results produced. Not only the external and internal walls, cornices and doors of the building here shown were constructed of béton, but all of the beams, floors and roofs were exclusively made of that material, reinforced with light iron beams and rods. All the closets, stairs, balconies and porticoes, with their supporting columns, were molded from the same material. All the exterior portions of this house, which are more or less ornamental in their functions, were made of béton in place during the progress of the work. In the interior of the house, the cornices, stiles and panels of the ceilings are formed of béton, and covered with the hard finish usual in such work. The only wood in the whole structure is the window sash and doors, with their frames, the base boards and stair rails. From this description it will be seen that a building has been erected as nearly incombustible as it is possible to conceive in the present state of the building art.

Concerning the materials employed in this construction, Mr. Ward says that only the best quality of Portland cement, clean beach sand and crushed bluestone were used. The proportions of cement used for the heavy wall work were one part of cement to four parts of sand and fine gravel, thoroughly mixed dry, and dampened with only sufficient water to give the mass the consistency of well-tempered molding sand. A finely crushed and screened hard blue limestone was found to be better adapted for use than a coarse-sized stone filling, because small-sized stones packed closer than larger ones, thereby realizing a proportionate saving in cement. The proportions of cement and coarse beach sand and gravel used in reinforcing the iron beams for floors and roof supports were one part of cement to two parts of sand and gravel.

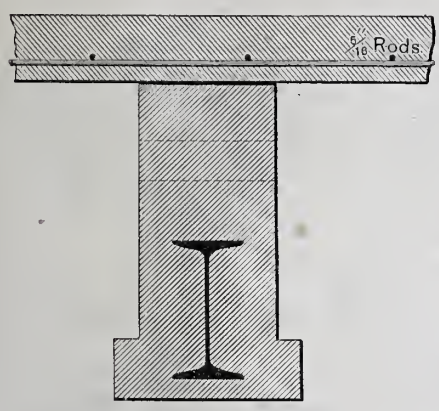
The method of reinforcing the beams employed was as follows: A plank mold was made the length of the iron beam, 12 inches deep by 5 inches wide, in the bottom of which a layer of béton was first moderately tamped down to an inch in thickness. Then the iron beam (4-inch I-beam) was laid on the course at equal distances from each side of the mold, and settled down to the surface of the course of béton to a good bearing. This brought the top surface of the beam 7 inches below the top of the mold. The work for filling and tamping the course was then continued until the mold was filled. The reason for placing the iron beam so near the bottom of the mold was to utilize its tensile quality for resisting the strain below the neutral axis when the composite beam was exposed to heavy loads, while the béton above this line was relied on for resisting compression from load strain. Thirty days were required for the béton to thoroughly harden. In preliminary experiments, a beam constructed in this way was tested by being placed upon suitable supports, with a bearing of 3 inches at each end. A lever was adjusted so as to bring the testing load on a knife-edge bearing at the center of the beam. Weight was then applied to the long end of the lever until the stress on the center of the beam was 9500 pounds. Under this load there was a deflection at the center of the beam of $\frac{7}{16}$ inch, but no sign of rupture appeared. On removing the load the beam returned to the original line it occupied before the test, showing that the combination possessed the essential quality of elasticity in addition to the enormous increase of capacity to resist strain over that which was possible for either material to sustain if used separately and in the same quantity. All the beams for supporting floors throughout the house were molded in position where they belonged in the general manner above described. They were placed at such distances apart as to insure perfect safety to the floors, and at the same time to afford ample opportunities for producing good effects in deep-paneled ceilings. The beams varied in width and weight per yard in proportion to their length and the prospective load they were to carry. When the combination beams were completed and ready for the floors and roofs, heavy planks were firmly placed in position and securely supported between the beams. The upper surface of these plank foundations was just on a level with the top surface of the molded beams. These planks served as the bottom of the floor molds, and after the béton comprising the floor was hardened they were removed. Before the floors and roofs were laid, care was taken to cover all the supporting surfaces with paper, to prevent the adhesion of floor and roof sections to their



*Reinforced Béton Construction.—Fig. 1.—View of House at Port Chester, N. Y., all Portions of which are of Molded Béton.*

supports. This precaution was necessary to permit the movement of the floors and roofs that would inevitably take place under varying temperatures and loads.

Instead of using sand and gravel, or both, in combination with cement, for floor and roof construction, the preliminary experiments




*Reinforced Béton Construction.—Fig. 2.—Section Showing Construction of Floor and Reinforced Iron Beam.*

that proved the superior value of broken bluestone for massive work led to the adoption of washed, fine screenings from the same material for the floors and roofs, because its greater angularity than gravel insured a stronger bond in the work than could be realized by using sand and gravel. The proportions of materials used for this purposes were one part of Portland cement to two parts of the fine stone screenings. The preparations being completed for laying down the floors, a thin course of the béton was first put on, and evenly tamped down, to about an inch in thickness, over the whole space intended to be covered. Then rods of of iron $\frac{5}{16}$ inch in diameter were placed both longitudinally and laterally, at a uniform distance of 8 inches apart, over the whole surface. Then on this a final layer of 2 inches in thickness was carefully tamped down. In about eight hours the béton was hardened sufficiently to allow the application of the top surface, which was floated down with a half-inch coat of cement and fine beach-sand mortar, made of equal parts of each. This completed the final finish, and made the whole thickness of the work 3½ inches. It will be observed that for the same reason as in beam construction, and as before explained, the iron rods for reinforcing were placed near the bottom of the work, so as to resist the tensional stresses due to the load, while that due to compression in the upper portion would be sustained by the béton alone. In this manner, and by this process, over 13,000 square feet of flooring and roofing were constructed to fill the requirements of the building.

A part of the experimental system contemplated an attempt to warm the house by passing currents of heated air between floors and ceiling, and up through flues made in close proximity to each other for that purpose in the interior walls of the building. It was necessary to core out a liberal area of lateral openings through the upper portions of the beams, in order to permit free circulation of heated air. In the center of the cellar there was built a heating chamber measuring 11 x 16 feet and 8 feet in hight. This is indicated in Fig. 3 of the engravings. Within this chamber there was placed an ordinary cast-iron heater having a capacity for burning 350 pounds of coal per day. Openings were made, about 12 inches apart, all around the top of the surrounding walls of the chamber, leading outwardly to the spaces between the first floors and the cellar ceilings, and also up through the flues within the interior walls which communicate with the spaces between the second-story floors and ceilings beneath them. Vertical iron pipes of suitable size are located so as to connect the open spaces between the cellar ceilings and first floor with a large closed trunk or passageway which extends nearly all around the inside of the main wall foundation, under the cellar floor, and finally terminates in a large flue which leads directly under and into the heating chamber. Its mode of operation simply consists in the body of warmed air passing from the heating chamber upward, through the walls and under the floors, and in its passage giving up its surplus heat to the surfaces of these flues. As the air becomes reduced in temperature it naturally descends back through the pipe and trunk passageways provided for its return to the heating chamber, where it is again recharged with heat. By this method a continuous circulation is maintained with the same quantity of air, and, furthermore, the velocity of the current varies with the difference of temperature of the air when leaving the heating chamber and when re-entering the heating chamber. With ordinary care in managing the furnace, Mr. Ward states that a temperature of 68° can be uniformly maintained on the first floor, and from 60° to 62° on the second floor, with a consumption of about 325 pounds of anthracite coal per day in the furnace. The temperature produced by this system of heating is free from the objectionable extreme variations so common with other modes of heating. The walls and floor form such large heating surfaces that the temperature is uniform in all portions of the rooms, while the air is not vitiated by escaping gases or heated dust, as is universally the case where furnaces or steam pipes are used for heating.

The rain-water falling upon the roof passes through two 6-inch iron pipes which are set in the walls, into a béton tank in the rear tower, holding 5000 gallons, whose water level is 30 inches below the level of the roof. These pipes form a distributing system to the various points of consumption in the house, through short branch pipes connected to the mains. There are also two other tanks made of béton, and holding 3000 gallons, situated under the main tank; one of these sustains a head of over 20 feet of water, and has never given any indications of leakage.

The results, as summed up by Mr. Ward from this experimental construction, are as follows:

*First.*—That a system of iron beams reinforced with béton can be made to sustain weights many times greater than the iron beams alone can withstand without reinforcing.

*Second.*—That floors and roofs can be economically made of béton reinforced with iron rods, capable of sustaining heavier loads, with a less number of supporting beams, than any other system of flooring and roofing now in use, at equal cost.

*Third.*—That the system of reinforced beams and floors affords advantages for a more perfect system of heating buildings uniformly than by the steam or hot-water systems.

*Fourth.*—That the sanitary requirements of complete ventilation are plainly within the reach of this system of construction.

*Fifth*, and finally.—That it affords a perfect defense against the interior destruction of buildings by fire.

With regard to cost, Mr. Ward says that the average for beams, floors and roofs, including the supporting platforms for laying them down, was a fraction over 60 cents per square foot. This cost also includes the reinforcing iron beams and rods. The cost of the heavy wall work, not including cornices, was about 24 cents per cubic foot, which includes the cost of plank molds required for building up the walls. The advantages that most favored these economical results were cheap material and cheap labor. The bulk of the material required for the work abounds in inexhaustible quantities, and is always obtainable at moderate cost. The essential skill required consists in a simple knowledge of the right proportions of material, and of its proper manipulation, both of which can be acquired in a half-day's practice. The most inexperienced laborers can do all the work of the most elaborate béton construction, excepting only the surface finishing, and this, with all the other work, can be superintended by one competent experienced builder.

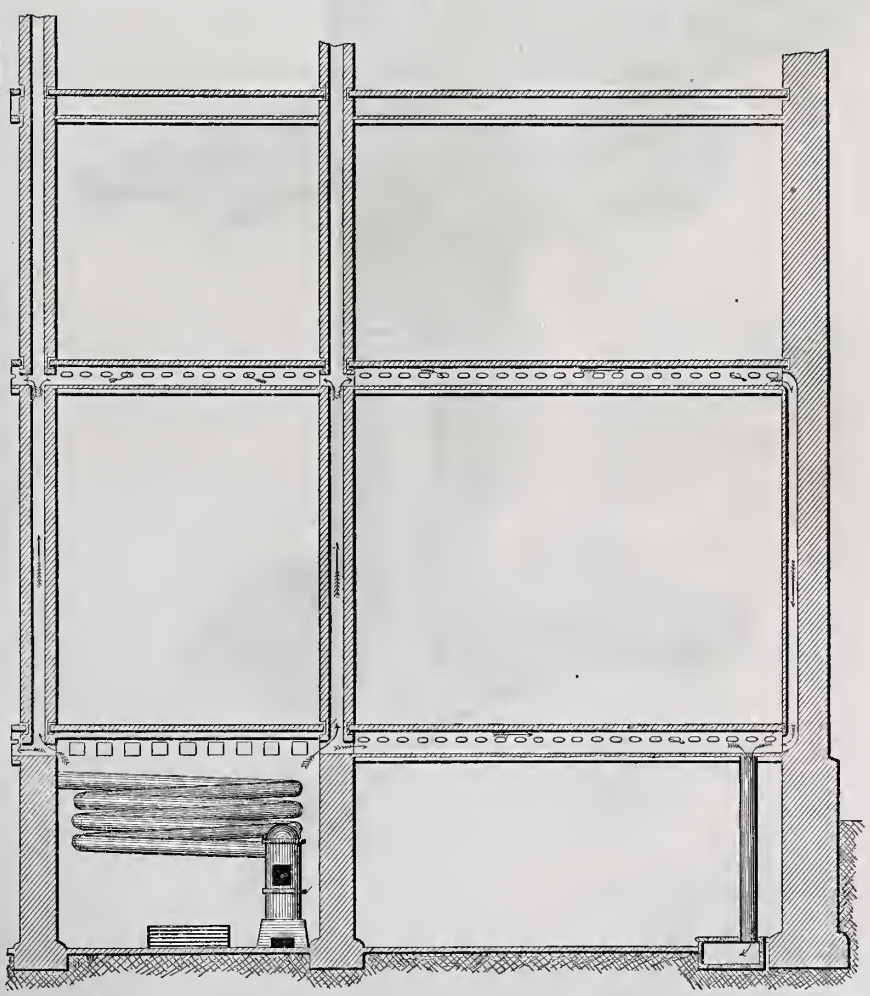
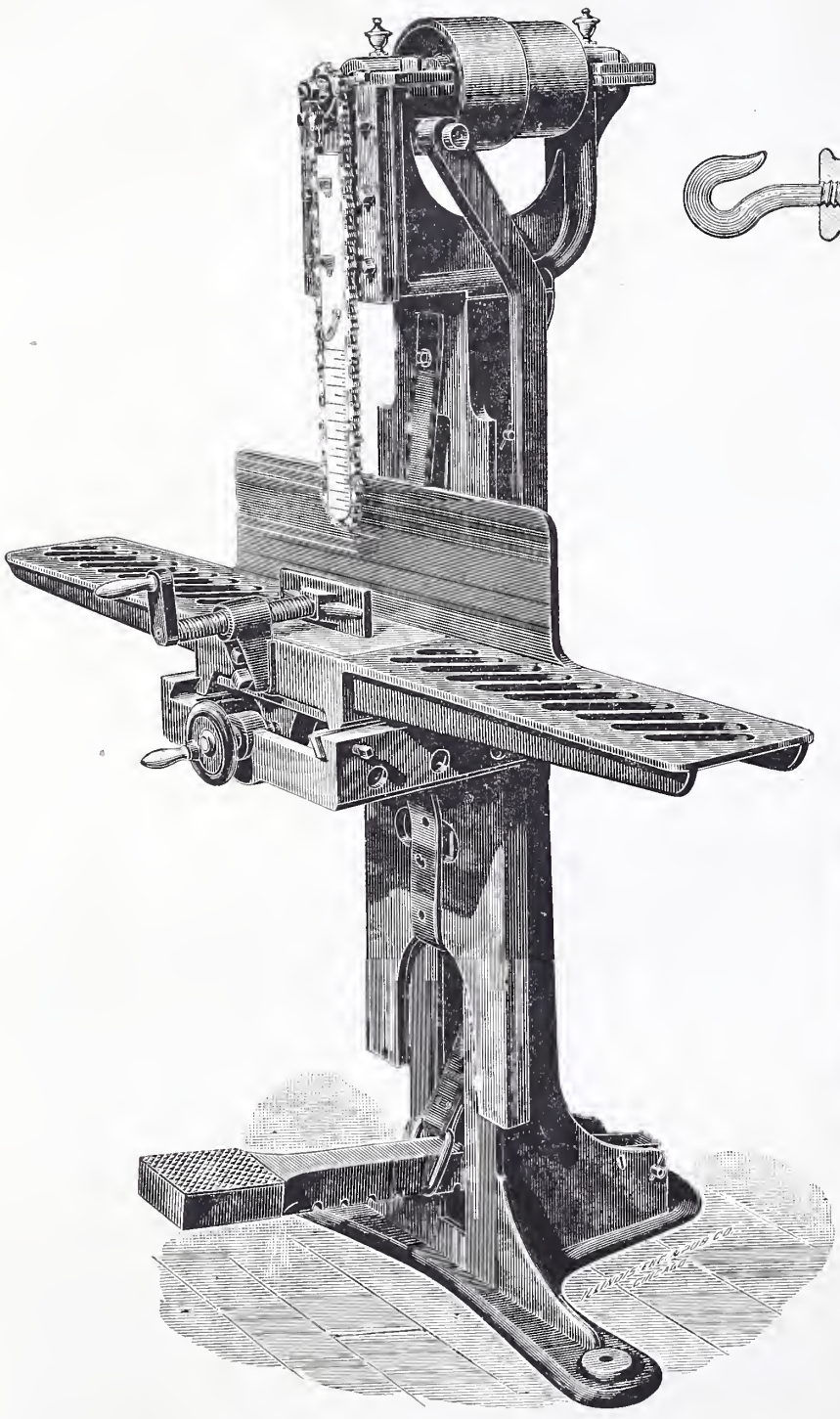


*Fig. 3.—Partial Section Through House, Showing Heating Apparatus and Arrangement of Distributing Flues.*

## NOVELTIES.

### Chain-Saw Mortising Machine.

The National Mortising Machine Co., of Chicago, Ill., are putting upon the market a number of tools embodying the principle of a chain-saw mortising device, one of which is shown in Fig. 1 of the engravings. This machine is adapted to various classes of work that arise in the shops of builders and contractors, and accordingly the manufacturers' claims for it cannot fail to be of interest. The statement is made that mortising machines embodying this improvement



*Novelties.—Fig. 1.—Chain-Saw Mortising Machine.*

are rapidly taking the place of chisel mortisers wherever wood-working machinery is employed, thus enabling the users to do better, cheaper and more rapid work than their competitors can hope to do by the old-fashioned methods. A chain-saw mortiser, it is asserted, will turn out nearly three times as much work in a given time as any chisel mortiser in use, and in a much more perfect manner. Among the further advantages which are pointed out may be mentioned that the tool can be operated by a boy, and requires no particular skill. Less power is required than in the case of a chisel mortiser, and it cuts through either hard or soft woods, whether knotty or otherwise, without marring or splitting. The mortise is cleaned as it is made, and the tool works with absolute trueness. As will be seen from the engraving, the cutting device consists of an arrangement of parts like a saw—yet in the general form of a chain—which is driven by the shaft of the machine around a suitably formed guide. The table of the machine is made to carry the work up against the cutting tool by means of the foot treadle. The tool shown is intended for general work in furniture, sewing-machine and cabinet-case factories and in planing mills, and has a capacity of mortising 8 inches deep by 3½ inches long and 1 inch wide, down to 1¼ inches long to ¼ inch wide. At this writing we have not had the opportunity to witness the working of one of these machines, but from testimonials that have been submitted to us, it would seem that the tools are giving satisfaction.

### Flexible Shaft.

From the fact that flexible shafting has been prominently before the mechanical world for several years past, it may not be a "novelty" to a considerable number of our readers, but, on the other hand, its uses have been restricted in such a way that we have no doubt that to many of them the application of it to wood-working purposes will be entirely new, and therefore we shall

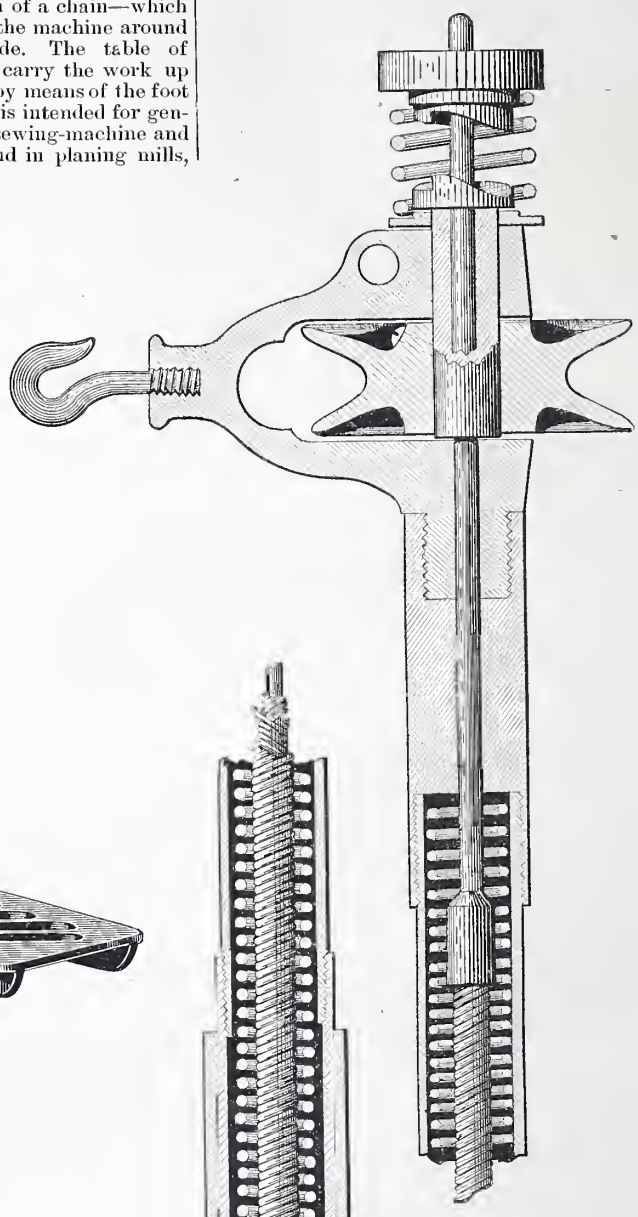


*Fig. 2.—Upper End of Stow Flexible Shaft.*

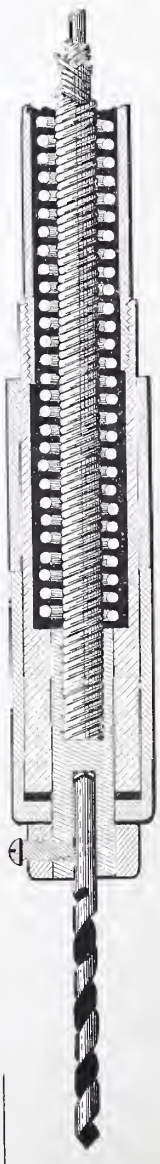


*Fig. 3.—Working End, Showing Gimlet Bit.*

describe the device in this department of the paper. The engravings, Figs. 2 and 3, show very clearly the nature and construction of the shaft. Briefly described, it is composed of a series of coils of steel wire wound hard upon each other, each alternate layer running in the opposite direction, and the number of wires in each of the layers varying according to the work the shaft is adapted to do. In finishing the shafts, about 1 inch at each end is brazed solid, and to these solid ends the fittings are attached, the one to receive the tools to be operated and the other to receive the power from the pulley inclosing it, which in turn derives its power from a belt. Outside of the shaft proper a case is placed, consisting of a single coil of steel wire, its internal diameter being a loose fit. This is covered with some flexible material, preferably leather, over

which at either end a ferrule is fastened. From this construction power is conveyed in any direction which the operator may require, while the hand, in using the shaft, is protected by the outer case last described. In many instances the flexible shaft may be used advantageously in wood-working shops, and for this purpose the manufacturers, the Stow Flexible Shaft Co., Limited, 1505 to 1509 Pennsylvania avenue, Philadelphia, Pa., have constructed a special shaft, the working ends of which are shown in our two illustrations. Fig. 2 shows the end furthest from the operator, and which is adapted to receive the power. It is, when in use, suspended by the combined action of a weight attached to a rope or chain fastened to the hook shown at the left, and a belt which passes around the grooved pulley shown in section, and over the pulley on a countershaft in the room in which it is being used. In this position, without the intervention of some means of throwing it out of gear, the shaft would revolve constantly. The pulley is made loose, however, and above it is placed an ordinary clutch, held out of contact by the spring shown in section in the engraving. This spring is of sufficient resistance not only to hold the clutch apart, but also to sustain the dead weight of the shaft itself. When it is desired to cause a bit, for example, to revolve, all that is necessary for the operator to do is to pull gently upon the shaft, when, overcoming the resistance of the spring, the clutch is thrown into contact and the pulley begins to turn. The second of our engravings shows the shaft with an ordinary bit, inserted as it would be used where a large number of holes of one size were to be bored. Of course, various tools can be similarly applied, and the shafting may be used for boring, polishing and other work occurring in wood-working establishments. From the fact that the tool may be used in any required direction, the employment of shafting of this kind is very advantageous in many positions.

### New Hand-Planer.

Fig. 4 of our engravings represents a 16-inch hand-planer, manufactured by Messrs. C. B. Rogers & Co., of Norwich, Conn. Machines of this character are so generally considered a necessity in wood-working establishments where planing out of wind, cornering, beveling, rabbeting, chamfering, squaring up and the making of perfect glue joints are required, that little is necessary to be said with reference to their general utility. The frame of this machine is cast in one piece, to prevent the possibility of its getting out of shape if not properly leveled on the floor of the shop where it is used. The cylinder is made of cast steel, and runs in self-oiling boxes. The cutters work 16 inches wide, and the top, which is feet long, is provided with an adjustable gauge for straight and bevel work. Both sections of the top may be drawn back on the planed ways, thus allowing easy access to the knives for the purpose of sharpening. Whenever the two sections of the top have been set level, they can, by means of the hand-wheels shown at either end of the machine, be adjusted independently of each other, so as to regulate the depth of the cut.

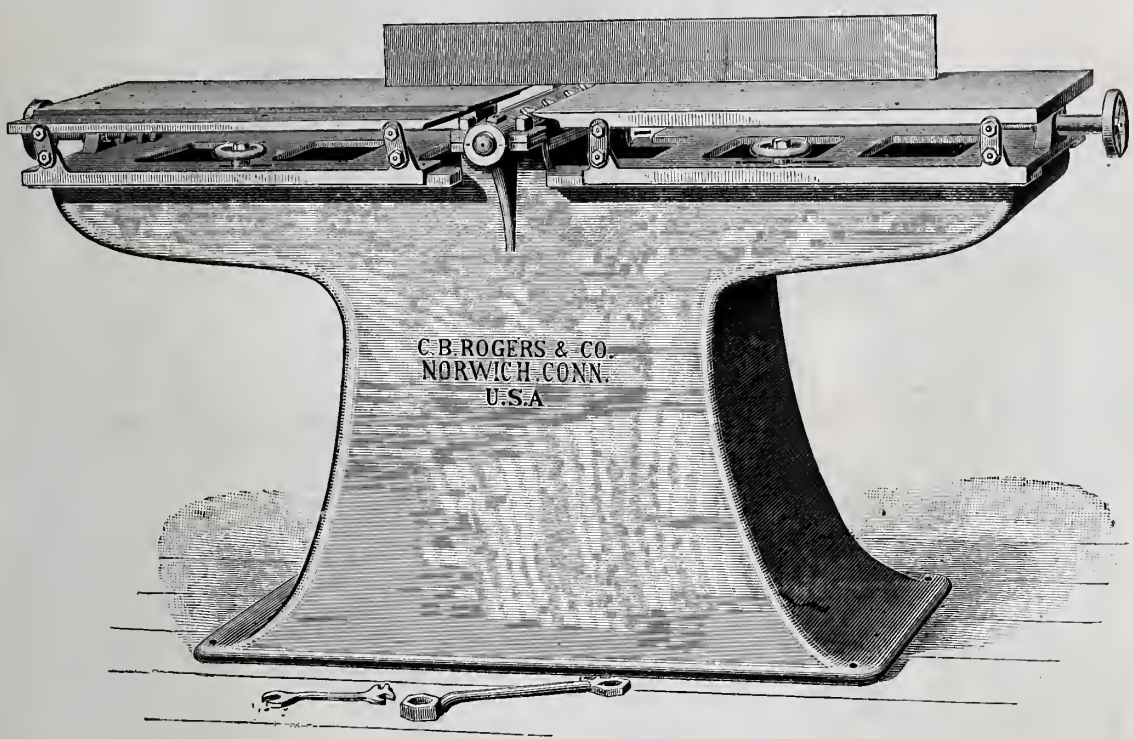



*Fig. 4.—New Hand-Planer, Built by C. B. Rogers & Co., Norwich, Conn.*

### The Forstner Auger Bit.

Growing out of inquiry in our columns some months since for a tool that would bore a square hole, our attention has been called to the Forstner auger bit, a device which we illustrate in Fig. 5 of the engravings. While this tool does not, perhaps, bore the kind of a square hole which our readers may have had in mind in considering the question as so far presented, it does do remarkable work, and is entitled to attention on that account. As may be seen by the engravings, the bit has no spike or screw center. A rim serves to guide it, and keeps it perfectly straight and true, whatever the character of the wood may be. On this account there is no danger of its deviating from its course by reason of knots, cracks, or hard or soft places in the grain of the wood. It may also be stated that it will bore equally well with the grain, and that it does not split the stuff, no matter how close to the side the hole is bored. This is frequently an important consideration to workers in wood. The hole produced by this bit is very true and is somewhat polished. The bottom is left smooth, an advantage over the ragged finish left by the worm of other bits. When a hole has already been made with a smaller auger, it may be bored larger by this bit, and as smooth and straight as if no hole had previously been made. A hole may be started in the edge of a board—that is, so close to the edge of the piece that only a portion of the circle will be cut. It will do this work perfectly. A hole that has already been bored may be made oblong, oval or square by the use of this bit. The latter is accomplished by using the tool somewhat as a wood carver would a gouge, it being revolved, however, in the process of cutting. In this same manner a spherical depression, very true in all its parts, may be made in the face of a block. Some of the different cuts which this tool is capable of making are illustrated in the accompanying engravings, Figs. 6 and 7, all of which have been prepared from samples of work done by it under our own inspection. The manufacturers call the attention of cabinet makers to this tool for doweling, for patching and for removing splits or knots, and in veneering. It is of advantage to carpenters and joiners for boring for such purposes as letting in locks, as it takes the place of the chisel and gouge. Pattern makers, stair builders and manufacturers of blinds, furniture makers and others will also find it useful in many places. By boring a round hole a short distance into a piece of timber, and then using the bit from opposite directions, cutting into the sides of the hole already bored, a square hole is produced, thus providing a place for the reception of a bolt head, as shown in Fig. 7. We do not know of any other bit that will do work of this kind. Various fanciful forms which we have not described in this connection are also produced by it. The manufacturers of this tool are Messrs. Forstner, Sharp & Co., Salem, Marion County, Ore.

*Fig. 5. — The Forstner Auger Bit.*

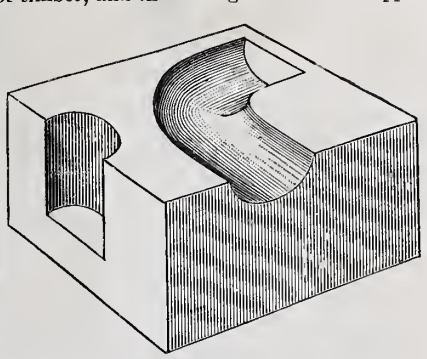


*Fig. 6.—Specimen Borings by the Forstner Bit.*

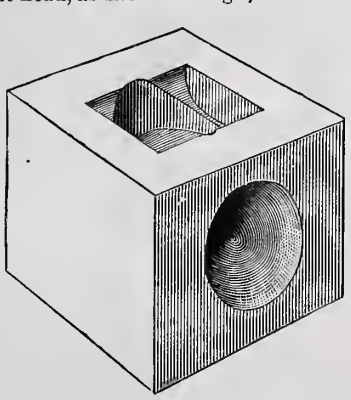
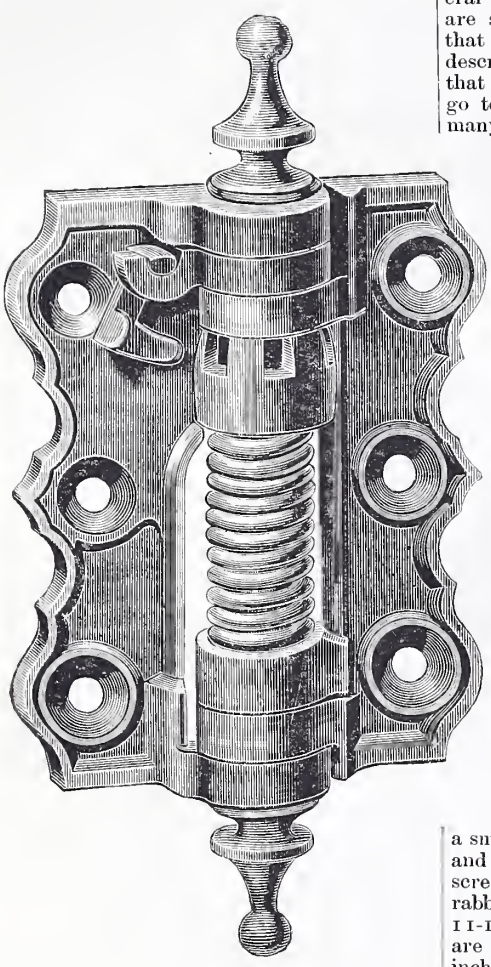


*Fig. 7.—Work Done by the Forstner Bit.*

### Spring Hinge for Screen Doors.

Fig. 8 of the engravings represents a surface spring hinge adapted for use upon screen doors, manufactured by the Clark Mfg. Co., of Buffalo, N. Y. As may be seen by reference to the engraving, the parts of



*Novelties.—Fig. 8.—New Spring Hinge for Screen Doors.*

this hinge are not only simple in form, but are strong, while the general design given to the device is such as imparts to it a neat appearance in position. The spring is of the spiral kind around the spindle of the hinge. The hinge is to be applied before the tension of the spring is taken up. The latter is accomplished by inserting a nail in the rotating collar shown just above the center of the engraving, and turning it to the right a quarter-turn. This being done, the latch or lever shown on the left-hand half of the hinge is then forced into one of the openings

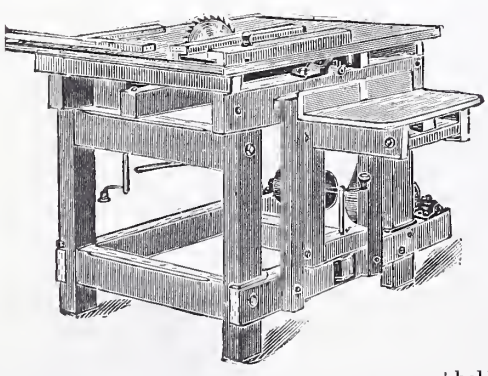


*Fig 9.—Combined Circular Sawing and Boring Machine.*

in the collar, thereby holding the tension firmly. Opening the door increases the tension, and consequently the door is always closed by the spring when left to the action of the same.

### Combined Circular Sawing and Boring Machine.

Messrs. Champlin & Spencer, of 152 and 154 Lake street, Chicago, Ill., are furnishing a combined power circular sawing and boring machine, a general view of which appears in Fig. 9 of the engravings. It is adapted to ripping, rabbeting, grooving, cross-cutting and boring, thus suiting it to the use of manufacturers of furniture, sash, doors and blinds, as well as in many other places. The general features of circular sawing machines are so well known to our readers at large that it is not necessary to point them out in describing this machine. The improvements that the manufacturers have embodied in it go to render this device more useful than many other sawing and boring machines. The frame is made from selected, well-seasoned Western ash, put together with joint bolts in a substantial manner. The machine will saw any thickness to 3½ inches, and uses a 12-inch saw. A 14-inch saw can be placed upon the mandrel if desired, although the machine is calculated for a smaller size. The table is 31 x 48 inches, and is raised or lowered by turning a crank screw that makes it very convenient for rabbeting or grooving. The steel arbor is 1 1-16th inches diameter in the bearings, which are babbitted, and turned at the end to 1 inch. The saw is driven by a countershaft attached to the rear of the machine, and can

*Fig. 10.—New Adjustable Countersink.*

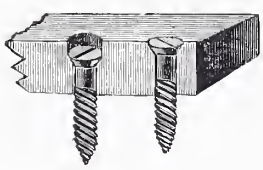


*Fig. 11.—Work Done by the Countersink Illustrated Above.*

be belted from above, below or horizontally, as circumstances may require. The attached countershaft carries tight and loose pulleys 6 inches in diameter and 3½-inch face. Each machine is provided with an adjustable ripping and cross-cut gauge, which can easily be removed when it is necessary for the purpose of sawing long stuff. The horizontal boring attachment shown in the engraving is designed to perform with accuracy that class of work in which holes are required to be bored. The table has a compound movement. It can be raised or lowered 6 inches by a crank screw that operates very quickly. It is supplied with adjustable stops which leave the holes all of a uniform depth. The arbor has a ½-inch hole in the end to receive the bit, which is held in position by a set-screw. The weight of the complete machine is 250 pounds.

### Adjustable Countersink.

The same firm are offering a new adjustable countersink. A general view of the device as applied to a twist bit is shown in Fig 10 of the engravings. By its construction it can be applied to brace and machine bits, gimlets, twist drills and all tools used for boring in wood where countersinking is required. As shown by the succeeding figure, it will be seen that two styles of countersunk work can be produced, and this is accomplished by simply reversing the knives by which the work is done. The device consists of a sleeve or ferrule slipping over the shank of the bit, which, by means of the two screws working at right angles to the bit, carries knives of the general shape shown in the engraving, that commence cutting as soon as the bit has penetrated far enough to bring them against the surface of the wood. It is evident upon inspection that the depth of the countersink may be regulated by the amount of projection given the knives outside of the sleeve which carries them. The knives, which are made of best tool steel, can be adjusted from the smallest to the largest screw which requires countersinking, and they do the work rapidly and satisfactorily.

### Foot-Power Mitering Machine.

A device for cutting moldings to different angles, and known as the Bodell foot-power mitering machine, is being manufactured by Mr. John R. Bodell, New Salem, Ohio. A general view of the machine is shown in Fig. 12 of our engravings. It will be seen to consist of a sliding carriage carrying the knives which cut the moldings, operated by a foot treadle in connection with a spring which raises the knives after a cut has been made. On the table of the machine adjustable gauges are so placed as to make it possible to set the machine for cutting any required angle. The machine occupies a floor space of about 30 inches square, and stands 30 inches high. The principal frame is made of ash-wood, while the frame of the working part is of iron. The knives are 6 inches wide,

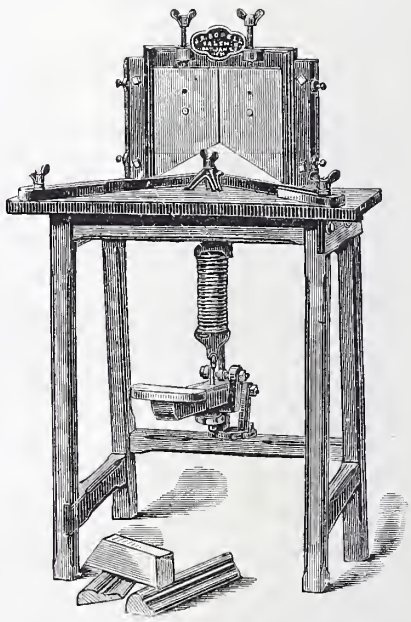


*Fig. 12.—Bodell's Foot-Power Mitering Machine.*

and are adapted to mitering 4-inch moldings. Either right or left hand cuts can be made, using either one or the other knife of the machine, as may be necessary. This tool has already achieved a local reputation, and builders pronounce it very desirable for use in fitting moldings of all kinds to any work. In addition to work of this kind, it may be employed for topping fence pickets and other similar parts. The manufacturer recommends it also to picture-frame makers, to whose wants it is well adapted, from the fact that it will cut the molding without injury to the finish.

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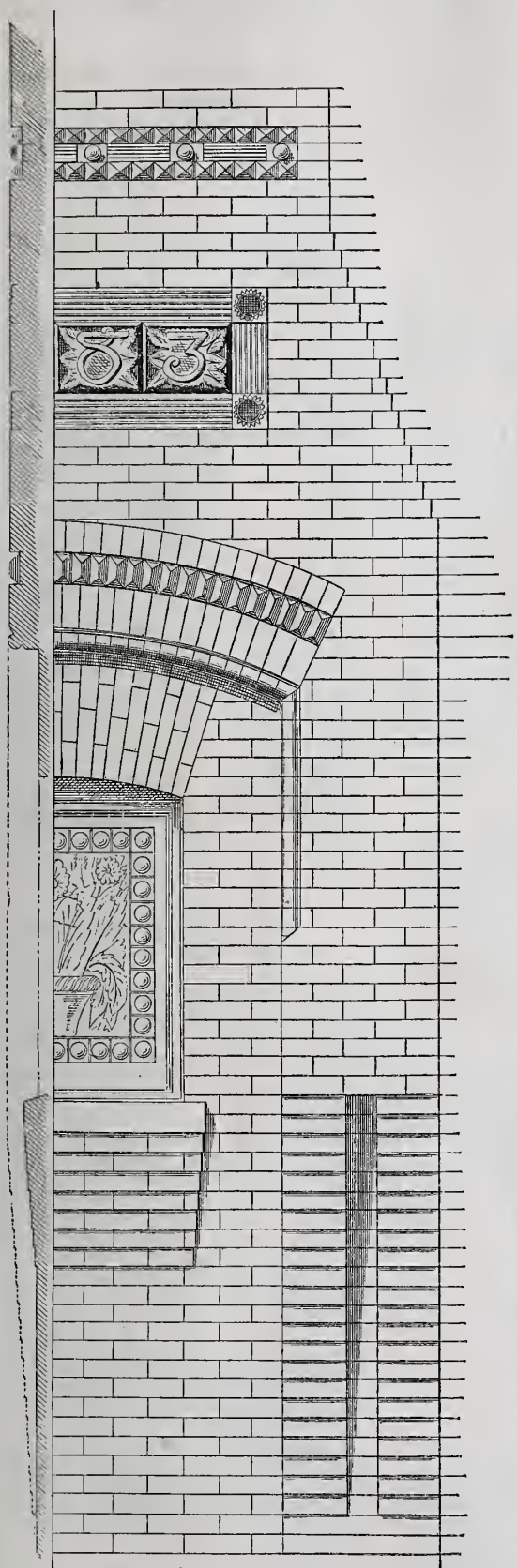
Recent observations of M. Parize tend to show that the weathering of brick walls into a friable state, which is usually attributed to the action of heat, moisture and frost, is in reality due to a microscopic creature, the action played by the weather being only secondary. M. Parize examined the red dust of crumbling bricks under the microscope, and found it to consist largely of minute living organisms, and a sample of brick dust taken from the heart of a solid brick also showed the same animalculæ, but in smaller numbers. The magnifying power of the instrument was about 300 diameters.

## Details of First Prize Design in the Ninth Competition.

On pages 133, 134 and 135 of this issue we present additional details of Mr. Church's design, the perspective, elevations and plans of which appeared in our number for June. Lack of space makes it necessary still to carry over for another month some of the engravings we had prepared. It has not been our fortune in a long time to examine a design so carefully considered and so thoroughly detailed in all respects as this one, and our readers who are interested in ornamental brick and wood work cannot fail to profit by its publication, even though the presentation of it necessarily requires several issues.



*First Prize Design, Ninth Competition.—Fig. 16.—Corbeling for Dining-Room, Nos. 5, 10, 12, 32, 62a and 277a, Peerless Brick Co., Used in Ornamentation.—Scale, ½ Inch to the Foot.*

## Fire-Proof Storage Warehouse.

Shortly after a very disastrous fire that occurred in this city two or three years since, we took occasion to comment on the insecurity of ordinary storage warehouses, and to point out some of the features necessary in a warehouse to make it strictly fire-proof and adequate to meet the requirements of the day in buildings of this character. A new storage warehouse has recently been completed in this city by the Manhattan Storage and Warehouse Co. which, in some respects, embodies the suggestions we at that time made, and which is pronounced as the most thoroughly fire-proof building extant. A description of it will undoubtedly be of interest to our readers. The building covers a plot of ground on the corner of Lexington avenue and Forty-second street, and is eight stories in hight. It is in three parts, the center part being a court, with two storage parts, each of which is surrounded by a substantial brick wall, and subdivided by four additional walls, all of which are 3 feet in thickness, thus forming five separate and distinct storage spaces, inclosed by three walls. All the pipes of every description—water, gas or sewer—are carried up through the court, leaving the storage spaces free from piping of any kind, thus avoiding all possibility of damage to goods by water or from any other cause. In the rear of the building, at the extreme hight of 120 feet, there is a large opening connected by an extensive flue directly down to the sub-basement, and there a powerful fan, driven by steam power, will force air through this flue into the several storing spaces, changing the air in them constantly and keeping them perfectly ventilated, thus guarding against mildew or damp, often so ruinous to furniture in storerooms. In this sub-cellar are also the engines for driving four powerful elevators, each of which is to be made large enough to take up a loaded truck to the floor where the goods are to be stored, thus avoiding the risk of damage by more than one handling. The center court is the highest part of the building, and at the top of it are two large tanks, each of which will contain 10,000 gallons of water, which is only to be used in case of fire. Pipes from this to various parts of each floor will have hose constantly connected, so that, in the event of fire occurring among any of the goods stored, it can be put out at once.

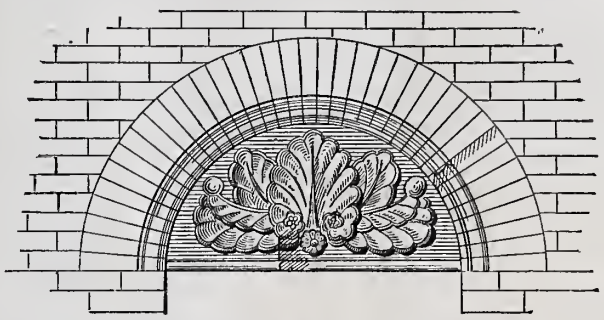


*Fig. 17.—Arch in Second Story.—Scale, ½ Inch to the Foot. No. 98 Used Next to Terra Cotta Work.*

Each of the five storage spaces on Forty-first and Forty-second streets is subdivided into smaller storing spaces, some very small, and varying to the largest size that can possibly be required, and all of them are completely and entirely fire-proof; in fact, there is nothing but brick and iron, with the best Portland cement and sand, used anywhere in the building. In the whole structure there is not one square inch of lumber; the doors, the window frames, the beams are all of iron, while the floors are formed by arches of concrete made of Portland cement and sand, insuring great strength as well as absolute safety from fire. The beams are entirely surrounded by this concrete, so that they cannot even heat in the event of a fire among the goods stored. The boilers are in the vaults on Lexington avenue, entirely outside of the building, and the engines are in the sub-cellar. On the second floor there is a steel-lined apartment for safe-deposit use, which it is claimed is one of the most secure and solid safe-deposit vaults in the city, and it is to be fully equipped with all the features common to such places of security. There is also an extra vault for the storage of silverware, and a storage space for oil paintings, where they can hang in a proper light, so that the damage which often has occurred from storing them in a dark room may be avoided.

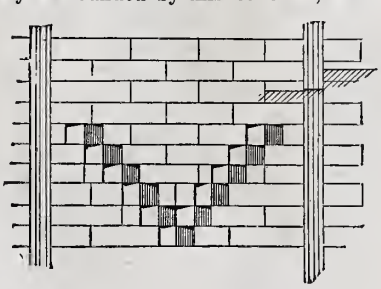


*Fig. 18.—Panel for Blind Window, South Side, Second Story.—Scale, ½ Inch to the Foot. Recessed Bricks are No. 20.*

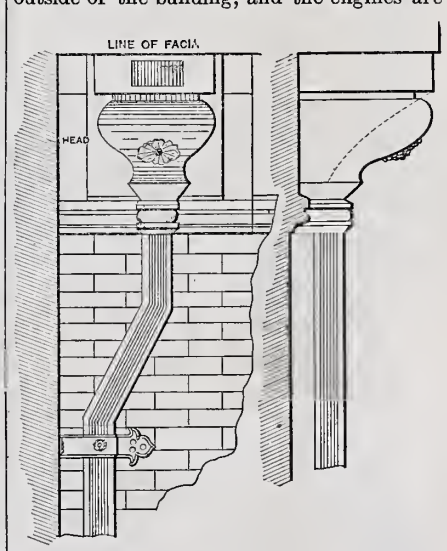
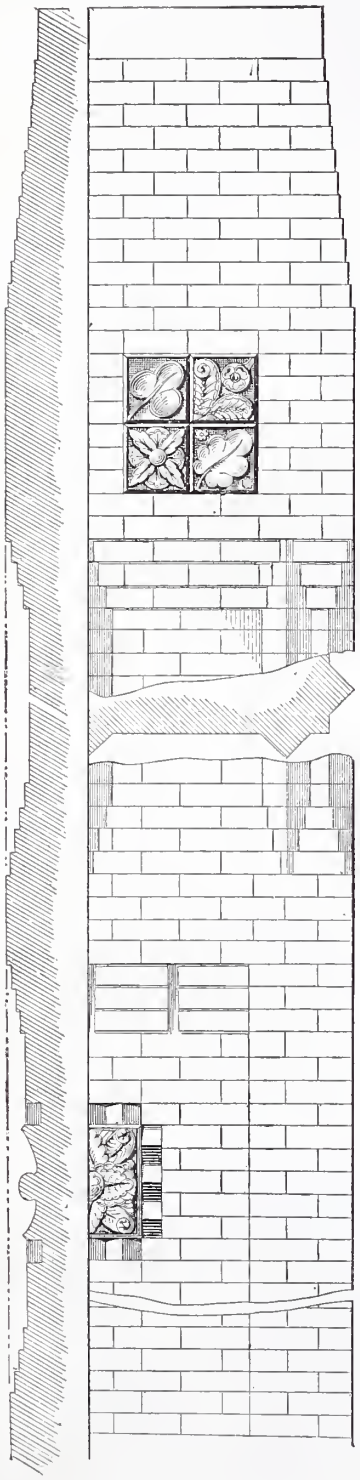



*Fig. 19.—Galvanized Iron Conductor Pipe, Head and Strap.—Scale, ½ Inch to the Foot.*

## TRADE PUBLICATIONS.

### How to Build a House.

The Co-operative Building Plan Association, of this city, have recently issued a pamphlet, quarto size, containing about 50 pages, bearing the above title. It is priced at 50 cents per copy. Instead of being a book devoted to building, as its title would indicate, it proves upon inspection to be simply a catalogue of building plans which the publishers propose to furnish at prices varying from $5 to $50 per set. The book is profusely illustrated with inferior woodcuts comprising elevations, perspectives and plans (drawn without reference to scale) of houses of various sizes



*First Prize Design, Ninth Competition.—Fig. 20.—Half Elevation of Chimney, with Plan of Shaft.—Scale, ½ Inch to the Foot.*

and styles, embracing much that is incongruous in character and bad in taste, and omitting entirely modern styles and features which are in actual demand. The illustrations seem to be discarded cuts from some of the magazines which have given attention to cheap architectural features in the past. The building plans which the company advertise are supposed to belong to the houses shown in the book, and ostensibly are to furnish all that is needed in making an estimate, drawing a contract and building the house. We have not inspected any of these working plans, and so are not in position to speak of them definitely. The fact that they relate to designs which are in very bad taste is sufficient to urge against them. It seems hardly possible that at the present day an

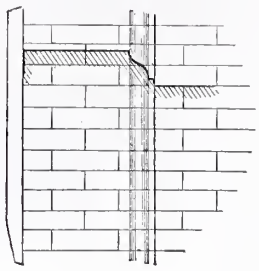


*Fig. 21.—Projecting Windows in Parlor and Dining-Room.—Scale, ½ Inch to the Foot. No. 4 Forms the Molding.*

enterprise of this kind should be started upon a basis so inadequate; but such is the fact. That it has been indorsed by many of the religious and technical journals is to be deplored, for satisfaction to the patrons of the company is hardly possible under the circumstances. Building houses to book plans or stock plans of any kind is at best an undertaking fraught with considerable risk. Certainly it should never be thought of without the most carefully prepared illustrations from competent architects, such, for example, as are published from time to time in this journal. Such drawings, with the superintendence of an experienced builder, are likely to produce satisfactory results—all others are likely to be failures.

### Encaustic Tiling.

We have had occasion at different times to call attention to the use of encaustic tiles for halls, fireplaces, and in other positions about buildings, and to describe some of the handsome catalogues which have been prepared to show the effects produced by tile of this kind. One of the most recent which has come to hand, as well as one of the handsomest, is issued by the American Encaustic Tiling Co., Limited, with office at 116 West

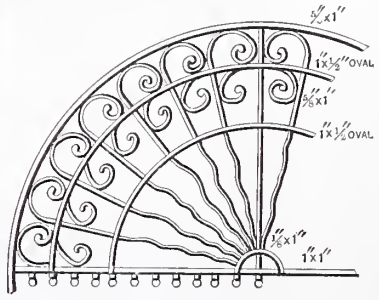



*Fig. 22.—Wrought-Iron Grille, Arch of Front Doors.—Scale, ½ Inch to the Foot.*

Twenty-third street, New York City, and factory at Zanesville, Ohio. The pamphlet is oblong, with handsome colored title on first page of cover, with a view of the factory at Zanesville on the last page. The title page was designed by Mr. W. Gumbs, Jr., and is a very creditable piece of work, whether considered simply as a design or as an illustration of the usefulness of tiles and the forms in which they may be worked, or as an example of color printing. The printing was done by Messrs. Kelly & Bartholomew, 22 College Place, and is a fine specimen of typographical art in all respects. Each page of the book contains a number of designs to scale of individual tiles, borders, corner-pieces, &c., all printed in colors. The printing has been done in a way to show the tiles in as nearly their natural colors and tints as is possible to produce upon paper. The book presents an exceedingly bright appearance, and is a desirable addition to the collections of enterprising builders and architects who have occasion to do work of this kind. The company who put forth this pamphlet rank well among American manufacturers of goods of this character, and are rapidly building up a desirable trade. Their assortment of shapes and colors is so large as to enable them to meet whatever demands are made upon them.

### Illustrated Catalogue of Building Hardware.

Messrs. J. B. Shannon & Sons, of 1009 Market street, Philadelphia, Pa., have sent

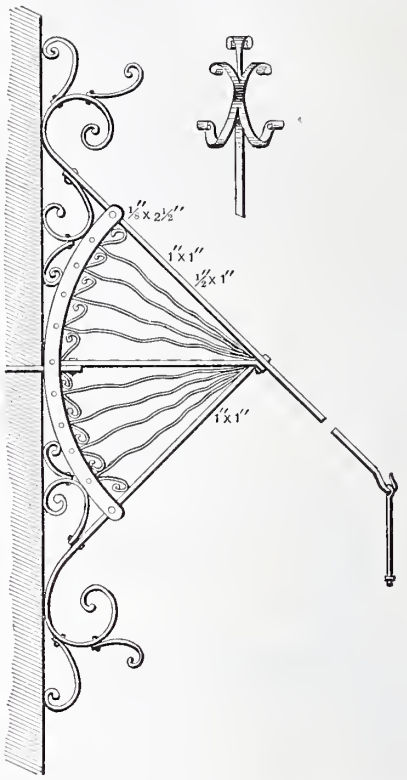



*Fig. 23.—Wrought-Iron Brace to Library Chimney.—½ Inch to the Foot.*

us a copy of their catalogue, No. 22, dated April, 1883, and which contains illustrations of building hardware. The objects in view in the compilation of this pamphlet have been to present in concise form all the leading items of hardware entering into the construction of buildings, with prices so arranged as to make it convenient for use upon the part of builders in selecting the goods they require. By the judicious circulation of catalogues of this general description, Messrs. Shannon & Sons have built up a large trade, their orders coming from all sections of the country. Builders who are situated away from a good supply of building hardware

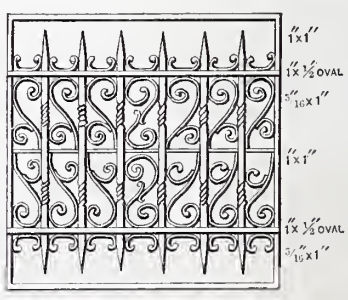



*Fig. 24.—Wrought-Iron Grille in Cellar Windows.—Scale, ½ Inch to the Foot.*

will find this book of great advantage; those also who desire to avail themselves of one of the best markets in the country in their purchases. The same firm issue catalogues of various specialties, so that correspondence with the house cannot fail to be of advantage. These books are sent free to applicants.

### Grates and Fireplaces.

In our May issue we noticed a catalogue of grates and fireplaces, issued by Mr. Charles B. Kline, of No. 430 North Third street, Philadelphia, Pa. It seems that at the time we reviewed the book in question a

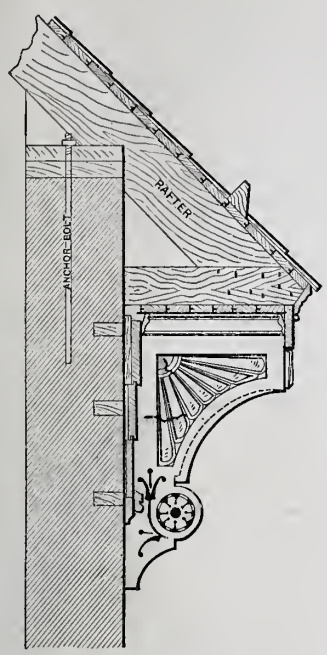



*Fig. 25.—Section Through Main Cornice.—Scale, ½ Inch to the Foot.*

portion of the matter that Mr. Kline had mailed us had failed to come to hand, and we take this occasion to acknowledge receipt of two large posters containing designs of

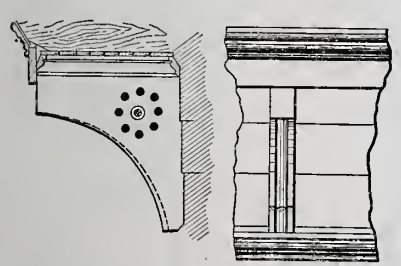


*Fig. 26.—Intermediate Brackets in Cornice.—Scale, ½ Inch to the Foot.*

grates, fireplaces, &c., containing the items of information which we mentioned his catalogue lacked. These posters are accompanied by a very complete price list and

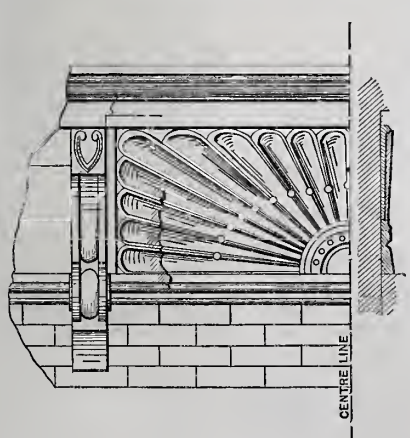



*Fig. 27.—Ornament Under Dormer Window, Front Elevation.—Scale, ½ Inch to the Foot.*

descriptive circular, making Mr. Kline's advertising matter of great advantage to those who are in search of information on the general line of goods described.

### How to Take Out Screws from Woodwork.

The following practical hints on this subject are from a long article in the London *Builder*, on "The Use and Abuse of Screws in Woodwork," and may save our readers much vexatious effort, not to say profanity, in the extraction of old and obstinate screws:

A difficulty is often experienced by persons who wish to withdraw a screw, by finding that though it will turn round under the application of the screw-driver, yet it will not come out. In this case a well-grounded suspicion may be entertained that the screw in question was driven, or nearly driven, home originally by the hammer, instead of gradually by the screw-driver, and that no regular thread corresponding with the screw exists in the wood. Under such circumstances it becomes necessary often to wrench off the hinge or hinges by force, at the risk of their breaking, and this often happens. When hinges have lain undisturbed for long years on old doors or other framings—perhaps for a quarter of a century or double that time—it becomes difficult to extract the screws, although they may have been originally properly driven. This arises from the screws rusting in the wood, and sometimes from other causes. Workmen themselves often fail to withdraw a screw, and are forced to break the hinge to enable them to get under the head of the screw and wrench it out. They often split, and break, too, fancy and delicate woodwork articles in their efforts to take off hinges, locks, mountings and other finishings, despite that simple methods exist for extraeting screws that have rusted in the wood. One of the most simple and readiest methods for loosening a rusted screw is to apply heat to the head of the screw. A small bar or rod of iron, flat at the end, if reddened in the fire and applied for a couple or three minutes to the head of the rusted screw, will, as soon as it heats the screw, render its withdrawal as easy by the screw-driver as if it was only a recently inserted screw. As there is a kitchen poker in every house, that instrument, if heated at its extremity and applied for a few minutes to the head of the screw or screws, will do the required work of loosening, and an ordinary screw-driver will do the rest without causing the least damage, trouble or vexation of spirit. In all work above the common kind where it is necessary to use screws, and particularly in hinge-work and mounting fancy fastenings and appliances affixed to joinery or furniture work, we would advise the oiling of screws or the dipping their points in grease before driving them. This will render them more easy to drive and also to withdraw, and it will undoubtedly retard for a longer time the action of rust.

### What is an Architect.

The late Mr. Alexander, the eminent architect, was under examination at Maidstone by Sergeant, afterward Baron, Garrow, who wished to detract from the weight of his testimony, and, after asking him what was his name, proceeded: "You are a builder, I believe?" "No, sir; I am not a builder, I am an architect" "They are much the same, I suppose?" "I beg your pardon, sir, I cannot admit that; I consider them to be totally different." "Oh, indeed! Perhaps you will state wherein the great difference exists?" "An architect, sir," replied Mr. Alexander, "conceives the design, prepares the plan, draws out the specification—in short, supplies the mind; the builder is merely the bricklayer or the carpenter. The builder, in fact, is the machine; the architect the power that puts the machine together and sets it going." "Oh, very well, Mr. Architect, that will do. And now, after your very ingenious distinction without a difference, perhaps you can inform the Court who was the architect of the Tower of Babel?" The reply, for promptness and wit, is not to be rivaled in the whole history of rejoinder: "There was no architect, sir, and hence the confusion."

In designing the elevated railroad stations in this city we have a notable instance of designers unequal to the task assigned them. In no particulars are the elevated railway stations what the requirements call for. Prime requisites for both safety and convenience have been sacrificed to what intelligent men should have known were whims of prevailing fashion. There is scarcely a station from one end of the road to the other

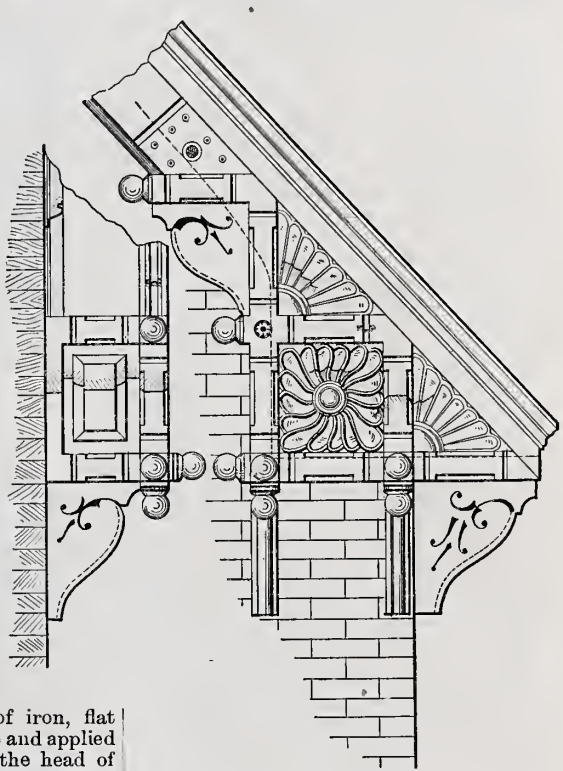


*Fig. 28.—Details of North and Rear Gables.—Scale, ½ Inch to the Foot.*

in which change after change has not been found necessary since the roads were opened. Stations have been repeatedly built in wrong locations, platforms made too long and too short, and waiting-rooms designed in such an absurd manner that they are probably not used by one in 10,000 of the passengers. In the passageways to the street there are some stations where four right angles are made.

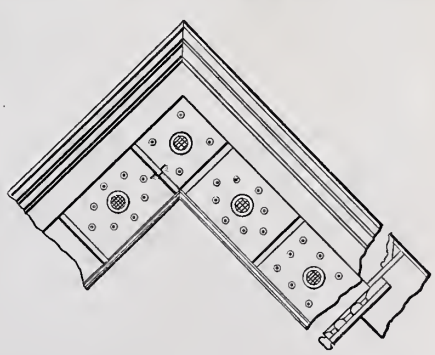


*Fig. 29.—Verge Board, Side and Rear Gable—Scale, ½ Inch te the Foot.*

These right-angled staircases are a characteristic feature of the elevated railroad work, especially on Second avenue, and are due entirely to the fact that when the artists were called upon to design the stations, East lake and Queen Anne happened to be the prevailing styles in furniture.

## Water Supply for Country Dwellings.

BY A COUNTRY PLUMBER.

II.

*Management of Tanks Located at a Distance from the Mill.*

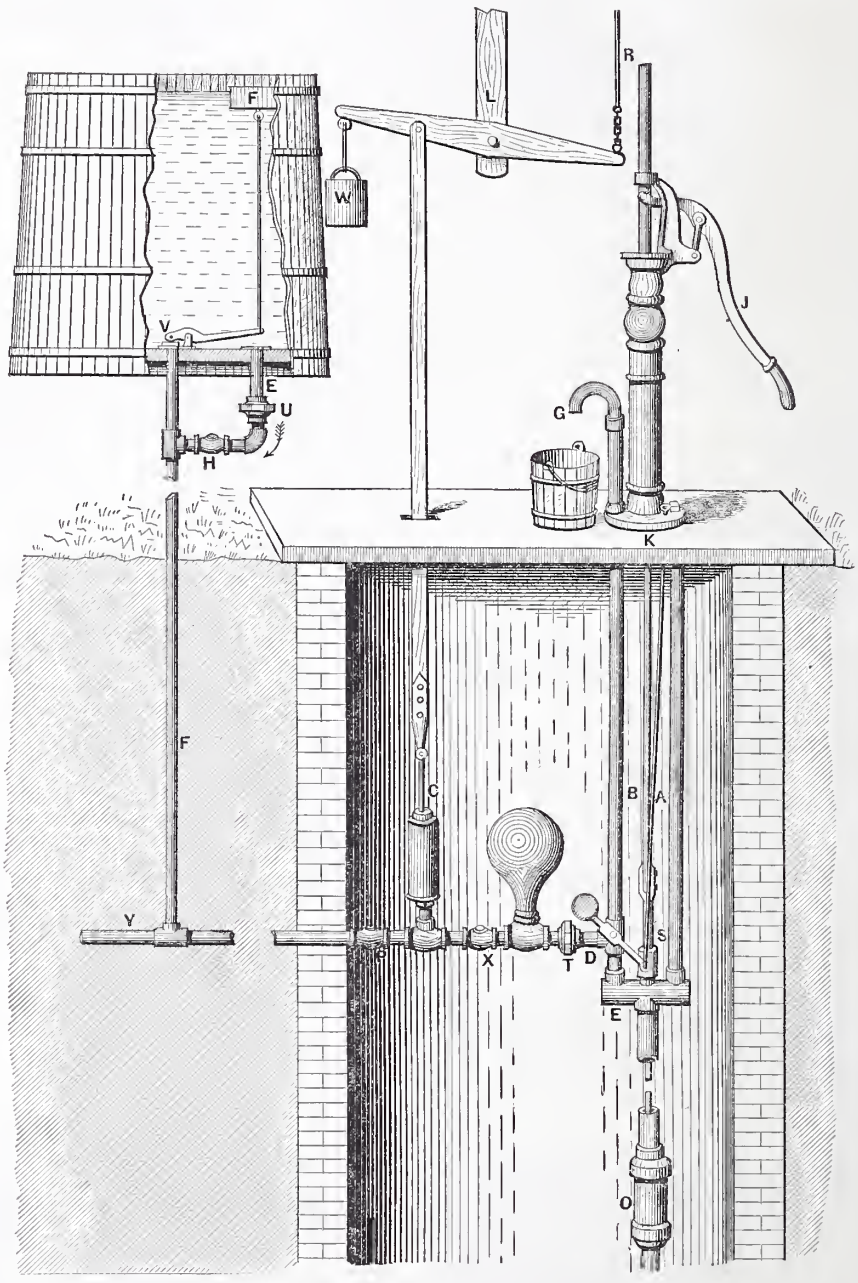
In connection with these articles two illustrations have been given of windmill towers with water-tanks in them, and two different attachments or plans for stopping the mill when tanks were full have been shown. I now present an illustration of a tank that may be placed at any distance from the mill and pump, in the attic of the dwelling, on elevated ground, or in a special structure for that purpose. The cut shows also another attachment for automatically stopping the mill when the tank is placed at a distance from the mill and not over 25 to 30 feet above the level of the ground at the mill.

Referring to the engraving, F is a float carried upward by the water rising in the tank, which will close the valve V by pulling on the lever L when the tank is full. Water is then forced into the regulator C, which is a simple hydraulic jack 2½ to 3 inches in diameter and 6 to 10 inches deep, raising the plunger, which, acting on the lever L in the mill tower, pulls down on the shut-off rod R attached to the windmill, and stops it. The weight W on the lever must be heavy enough to hold the plunger down while the tank is filling. When water is drawn from the tank the float sinks and releases the valve V, and the weight W forces the plunger down again in the regulator C, and thus allows the sails or wind-wheel to spread to the breeze, or, rather, *vice versa*, for the drawing of even a small quantity of water from the pipes at any point instantaneously releases the regulator plunger, when, if there is a breeze, the mill will resume pumping, and fresh water will be obtained at the tap instead of water from the tank. Two check-valves H are used on the discharge or conveying pipe; one between the air chamber and regulator to prevent water escaping from under the regulator plunger should the stuffing-box S be slack and leak—the other one between the regulator and tank to prevent water from the tank escaping at the regulator in case its plunger is slack or needs repacking. Frequently but one valve, the last mentioned, is used; two are a necessity and will save annoyance. They should be the very best obtainable.

The pump shown in the illustration is quite different from those already described. T is an attachment for hand pumping, and can be attached or detached in a moment without removing any part of the windmill connections except a shackle-pin. At K is a handle, connected by rod A to a lever operating the three-way cock D, by means of which water can be discharged through pipe B and spout or goose-neck G on the platform. This spout has threads for hose coupling. Water can be forced into the tank through pipe F by pressing the handle K down, which closes pipe B and opens the passageway to the discharge and conveying pipes F and Y. O is the working section or pump cylinder, which should in all instances be of brass or of some material not easily corroded, and be provided with raised brass valve seat and all brass plunger. The leather packings commonly used in pump cylinders of this pattern do not become hard and stiff when in contact with brass, as they invariably do in iron cylinders, and consequently continue in effective working order much longer. The cylinder, if the pump is placed in a well, should be set as near the water as practicable, and if submerged, all the better, for it can then never lose its priming. Under no circumstances is it well to place it more than 15 feet to 18 feet above low-water line Twenty-five feet, as advised by some, is too far for constant successful working when attached to a windmill which is expected to remain in working order with scarcely any attention. If for any reason the cylinder cannot be set within 18 feet, perpendicular measurement, of the water, a vacuum chamber should be put on the suction pipe just below the cylinder. If the pump is set in a pit with a long descending or horizontal suction pipe, a vacuum chamber is necessary in all cases.

When the tank is situated so that the discharge or conveying pipe can be utilized for distributing or service pipe, and a valve is placed in the tank, as shown in the cut, an outlet from the tank into the discharge pipe must be provided. An arrangement is shown by which water may be drawn from the tank into the pipe while valve V is firmly closed. Pipe E is flanged to bottom of tank, and connected with discharge pipe F by a gas-pipe T. At H is a chuck-valve, set so that it closes against water entering the the tank through pipe E, but permitting it to flow from the tank, as indicated by the arrow. Union U is used to make connection. A separate service or distributing pipe may be flanged to the tank if desired, but, in many instances, this arrangement will save the expense of two pipes. If it is not desired to have the mill cease pumping of its own accord when the tank is full, the connection of pipes and check-valve beneath the tank, the regulator and one check-valve may be omitted.

The writer has seen two long lines of pipe laid side by side, one as a conveying or discharge pipe from the pump, the other one as a distributing or service pipe, and both attached to the same reservoir, when but one was necessary. He has yet to see a windmill job where two such pipes were an actual necessity. Such a case has never been met in his experience or observation. Discharge pipes to tanks are frequently carried up and empty into top of tank, rendering frost-proofing very difficult, and constantly disturbing the sediment at bottom. These cannot, for obvious reasons, be connected with distributing pipes They needlessly increase the labor of pumping, as the hight or depth of tank and its pressure is always upon the pump. I have seen pipes attached to tanks by boring a hole and simply screwing the pipe into the wood. A mechanic who would perform such a botch job is unfit to be trusted. Use flanges well seated in lead and firmly, bolted fast so that no amount of jarring or wrenching can loosen them, and into these screw your pipes, if iron, firmly.




*Tank with Automatic Stopping Attachment that May be Placed at a Distance from the Mill.*

New York has recently done some very remarkable things in the way of mechanical ornamentation, if we may so term it. One of her leading buildings has, as a striking characteristic, on its most prominent corner an immense whip-socket, some 30 or 40 feet long, which is used, like any other whip-socket, to hold a whip, or, in this case, a gigantic flag-pole. The latest phase of the mechanical decoration movement is in the ornamentation for letter carriers, who have recently been provided with a nice granite-ware "maslin" kettle instead of a hat. This, judging by appearances, is screwed upon the head by means of a set-screw, the hexagonal head of which is allowed to project from the top of the kettle, and while serving the useful purpose of adjusting the hight of the hat upon the head, forms, when neatly lacquered, a pleasing ornament to the bottom of the kettle. If the letter carriers' brains must be boiled, it is evident that the cheapest way in the end will be to boil them in a kettle where burning to the bottom will not prove injurious.

## DECISION IN THE ESTIMATE COMPETITION.

We announced in our last issue that the estimates received in the Eighth Competition were still in the hands of the committee to whom had been referred the question of a decision in this contest. Owing to the length of the estimates, some of them requiring double the space we could spare in any one issue, it has been deemed inexpedient to attempt to decide this contest by a popular vote, as it was our wish to do. Accordingly, therefore, the question was referred to a committee. An unusual amount of labor has been expended in comparing results and in obtaining the opinions of experts in estimating, in order that no injustice should be done competitors. According to the report of the committee, the effort submitted by Mr. J. D. Sibley, of Middletown, Conn., is considered to be the best according to the terms of the advertisement, and is therefore awarded the first prize. The second prize is adjudged to belong to Mr. G. W. Payne, of Carthage, Ill., while the third prize is awarded to Mr. Eden Bechtel, of Philadelphia, Pa. The committee also recommend for honorable mention the efforts submitted by Mr. A. S. Lawdon, Concord, Mass., and Mr. V. Tomlinson, of Boone, Iowa.

The estimate submitted by Mr. Bechtel is in some respects the most elaborate, the most carefully prepared and the best considered of all that were received in this contest. The Editor deems it worthy of first place, so far as concerns publication, from the fact that it presents the theory and practice of estimating in a way to be of great value to students in the building trades. The objections urged against it, as we learn from the report of the Committee of Award, and which alone lost it a higher place, are, first, the fallacious plan of basing allowances for labor upon cost of material. Those of our readers who examine the schedule published herewith will notice that in some instances labor is figured as a definite percentage of the cost of material. This, practical builders generally will agree with the committee, is a plan unreliable in the extreme, and likely to lead to serious errors. To cite an example named by one of the experts, the cost of framing this building could not vary any great amount, whether hemlock or clear white pine was used in the skeleton. If there was any difference, it would probably be in favor of the pine, because of easier working. But by Mr. Bechtel's method, the latter would be figured very much higher, simply because clear white pine is worth more in the market. Another reason which the committee give in their report for preferring other estimates to this for the first and second prizes is that it is not a model estimate, considering it simply from a practical standpoint—that is, as an estimate that would be made for actual use. They commend it very highly, however, as an exposition of a method of making estimates. Scarcely any one in regular business could be expected to analyze and list the items of cost in a building as carefully as this author has done. While this objection has force in the light of a strict interpretation of the original advertisement, this feature renders this estimate of greater value to the readers of *Carpentry and Building* than any other that was submitted; hence the Editor has chosen it from the three to which prizes are awarded as the first for publication. With the exception of the single adverse criticism above that reflects upon its accuracy as a price list, we deem it the most important contribution to the literature of this subject that has ever been published. By this we would not be understood as indorsing it in every part, for there are some exceptions which, in our judgment, should be taken, but we commend it as a study—as a clear exposition of a rational method of listing and pricing the items that enter into the construction of a modern building. One good feature about the estimate, as a whole, is that it is so arranged as to be readily understood in all its parts, and therefore intelligently discussed by all who have any exceptions to take or suggestions of improvement to offer. A very large proportion of the benefits to be derived from this contest will be from the intelligent criticisms from our readers at large. We shall welcome letters upon this subject now or at any future time. The space at our command this month unfortunately prohibits the presentation of this estimate in full. We give about one-half of it at this time, and expect to complete it in our next number. The other prize estimates will follow as soon as space can be found for them.

While the question of actual cost is one of secondary importance in this matter, and one which, by the conditions of the contest, has not affected the main question at all, save as certain items have appeared, in the judgment of the committee and of the experts employed, to be out of proportion with the balance of the list, a large number of our readers will be interested in a statement of results reached by the principal competitors. We accordingly annex the same, with such remarks as are necessary to place the competitors upon an equal footing:

TOTAL COST OF BUILDING ACCORDING TO THE BEST ESTIMATES.

| | |
|---|---|
| Sibley, including builder's profit | $11,976.21 |
| Payne, actual cost to builder | 8,940.88 |
| Bechtel, " " | 9,743.27 |
| Lawdon, including builder's profit of 15 per cent. | 12,218.69 |
| Tomlinson, actual cost to builder | 9,834.00 |

Allowing a profit of 15 per cent. to those who have presented the figures of actual cost, we have the following:

| | |
|---|---|
| Sibley | $11,976.21 |
| Payne | 10,282.00 |
| Bechtel | 11,204.75 |
| Lawdon | 12,218.69 |
| Tomlinson | 11,309.10 |

And, taking the average of these five totals, we have $11,398.25 as the presumptive value of the house under consideration. All this, however, is only a matter of curiosity—not the presentment of a fact, for as each competitor furnished his own price list, and as the several contestants live in different parts of the country, there is no reason why these results should be compared, or why they should, by being averaged, give a figure that is of any practical importance. All this said, however, it remains that, were the above list the result of some public letting, somebody would offer remarks on close figuring, &c.

Every one who desires to know the value of this house in his own locality will do well to make out his own estimate in the light of some of the models that will in a short time be before him.

## Third Prize Estimate.*

BY EDEN BECHTEL.

In making an estimate there are three general divisions to be considered:

1. Taking the dimensions.
2. Bringing quantities together.
3. Putting prices to the estimated quantities and adding up the result.

In taking the dimensions, take up the different branches in the same order that they are carried out when the work is done, viz.: 1, excavating; 2, masonry; 3, brickwork; 4, carpenter work; 5, millwork; 6, tin roofers' work; 7, plasterers' work; 8, hardware and iron work; 9, plumbers' work; 10, gasfitters' work; 11, bell hanging; 12, heating and ventilating; 13, painting and glazing; 14, mantel work, and 15, miscellaneous.

Under each of the above divisions, state, 1st, what portion of division you are taking; 2d, how measured; 3d, how taken; 4th, the measurements; 5th the analysis of cost.

Insert in front of the measurements the portion of the work they include. This is of great value to identify work subsequently, and is of use while making an estimate. In measuring, 12ths or 10ths can be used; if taken in 12ths, by changing the 12ths to 10ths the operation of multiplying will be very much simplified. In all cases where practicable, state the length first, breadth next, and last the depth or thickness.

### Excavation.

CELLAR.

At per cu. yd. of 27 cu. ft.

[Take length, breadth and depth. No corners measured double; only actual earth removed taken. The outside line of footings, which is 1 foot beyond the face of brick underpinning, is taken as the line of excavation.]

| | | |
|---|---|---|
| South part of cellar. | 37 ft. 6 in. x 16 ft. 0 in. | x 2 ft. 8 in. = 5,273.1 cu. ft. |
| S. w. bay | 13 ft. 0 in. x 3 ft. 6 in. | |
| S. e. bay | 11 ft. 0 in. x 2 ft. 0 in. | |
| N. e. part of cellar. | 34 ft. 6 in. x 25 ft. 6 in. | |
| N. w. part of cellar. | 26 ft. 6 in. x 13 ft. 6 in. | |
| Cor. near bay, east. | 2 ft. 0 in. x 2 ft. 0 in. | |
| Area | 11 ft. 0 in. x 4 ft. 0 in. | |

5,273.1 cu. ft. ÷ 27 = 195.3 cu. yds., at 31¢ = ..... 60.54

*Analysis of Price per Yard.*

Allowing the dirt to be removed 500 ft., and supposing the earth to be a clay soil.

1 man can pick 10 yds. per day; wages being $1.50, picking 1 yd. will cost ..... 15¢
1 man can load 25 yds. per day; wages being $1.50, loading 1 yd. will cost ..... 06¢
1 man with horse and cart can remove 25 yds. per day; wages being $2.50, 1 yd. will cost ..... 10¢
Total cost ..... 31¢

FOOTINGS.

At per cub. yd. of 27 cu. ft.

[For the length take a line through center of footing, breadth and depth according to specification. In this case the face of brickwork is approximately the center of footing. Commence at one corner and measure towards the right.]

| | | |
|---|---|---|
| East side | 43 ft. 6 in. | x 2 ft. 6 in. x 1 ft. 8 in. = 750 cu. ft. |
| North side | 46 ft. 0 in. | |
| West side | 52 ft. 0 in. | |
| South side | 38 ft. 6 in. | |

750 cu. ft. ÷ 27 = 27.7 cu. yds., at 31¢ = ..... 8.58

FOUNDATIONS FOR INSIDE WALLS.

At per cu. yd. of 27 cu. ft.

[When foundations are less than a foot deep they are counted the same as if they were 1 foot in depth. Take size same as for footings.]

| | | |
|---|---|---|
| Division walls | 90 ft. 0 in. x 1 ft. 6 in. | x 1 ft. 0 in. = 176. cu. ft. |
| Chimneys | 5 ft. 0 in. x 2 ft. 6 in. x 3 | |
| Chimneys in laundry | 2 ft. 4 in. x 1 ft. 6 in. | |
| Area | 17 ft. 0 in. x 1 ft. 6 in. x 1 ft. 8 in. | = 42.5 " |

218.5 cu. ft.

218.5 cu. ft. ÷ 27 = 8.9 cu. yds., at 31¢ = ..... 2.75

TRENCHES FOR PLINTH.

At per cu. yd. of 27 cu. ft.

[For length, breadth and depth take same as footings.]

| | | |
|---|---|---|
| South street | 247 ft. | x 2 ft. x 3 ft. = 2,364 cu. ft. |
| Main street | 70 ft. | |
| Walks | 77 ft. | |

2,364 cu. ft. ÷ 27 = 87.5 cu. yds., at 31¢ = ..... 27.12

Amount forward ..... $98.99

* For elevations and details, see *Carpentry and Building* for July, 1882. For specification of materials and labor, see "Star" in October issue for 1882.

Amount brought forward.....$98.99

TRENCHES FOR DRAINS.

At per yard run.

[Take length in yards and average the depth. A trench 2 ft. wide can be dug as economically as a narrower one.]

To cesspool. 27 yards, 5 ft. depth x 2 ft. width, at 32¢ = $8.64
Overflows.. 26 yards, 3 ft. depth x 2 ft. width, at 19¢ = 4.94 — 13.58

CATCH BASIN, CISTERN AND CESSPOOL.

At per cu. yd. of 27 cu. ft.

[Find the contents as follows: To the inside diameter add the thickness of walls, for the diameter of excavation. Then find the area of the circle, and multiply by the depth for the contents.]

1 cesspool, 9 ft. diam., 11 ft. depth; No. of cu. ft. = $9^2$ x .7854 x 11 ft.
1 cistern, 9 ft. 6 in. diam., 10 ft. depth; No. of cu. ft. = $9\frac{1}{2}^2$ x .7854 x 10 ft.
1 catch-basin, 5 ft. diam., 7 ft. depth; No. of cu. ft. = $5^2$ x .7854 x 7 ft.

$9^2$ x .7854 x 11 ft. = 699.79 + cu. ft.
$9\frac{1}{2}^2$ x .7854 x 10 ft. = 708.82 + cu. ft.
$5^2$ x .7854 x 7 ft. = 137.44 + cu. ft.

1,546.05 + cu. ft.

1,546.05 ÷ 27 = 57.3 cu. yds., at 44¢ per yd. =..... 25.21

*Analysis of Cost per Yard.*

Earth to be thrown out and removed a distance not to exceed 500 ft. Soil supposed to be clay.

1 man can pick 10 yds. per day; wages being $1.50, picking 1 yd. will cost..... 15¢
1 man can throw out 12 yds. per day; wages being $1.50, throwing out 1 yd. will cost..... 12½¢
1 man, horse and cart can load and cart 15 yds. per day; wages being $2.50, removing 1 yd. will cost..... 16½¢

Total cost per yd..... 44¢

REMOVING SOD AND PACKING.

At per superficial yd. of 9 sq. ft.

[Take length and breadth.]

North side..... 76 ft. 0 in. x 39 ft. 6 in.
South side..... 65 ft. 6 in. x 31 ft. 0 in.
South side..... 15 ft. 0 in. x 12 ft. 6 in. = 5,220 sq. ft.

5,220 sq. ft. ÷ 9 = 580 sq. yds., at 5¢ =..... 29 00

*Analysis of Cost per Yard.*

Sods to be left on lot.

1 man can cut 60 sq. yds. per day; wages being $1.50, cutting 1 yd. will cost..... 2½¢
1 man can remove and pack 60 sq yds. per day; wages being $1.50, removing and packing 1 yd will cost..... 2½¢

Total cost per yard..... 5 ¢

FILLING TRENCHES AGAINST WALLS.

At per cu. yd. of 27 cu. ft.

[Take same as excavation.]

| | | Breadth. | |
|---|---|---|---|
| Dist. around house. | 184 ft. | 8 in. at top. | x 2 ft. 9 in. = |
| " " piers.. | 70 ft. | 3 in. at bot. | 424.17 cu. ft. |

424.17 cu. ft. ÷ 27 = 15.71 cu. yds., at 7½¢ = ..... 1.17

*Analysis of Cost per Yard.*

1 man can ram and fill in 20 yds. per day; wages being $1.50, 1 yd. will cost..... 7½¢

Total Excavating.....$167.95

## Masonry.

CELLAR WALLS, FOOTINGS, PLINTH FOUNDATIONS.

At per perch of 24.75 cu. ft.

[For the length of wall, measure it on a line drawn through the center. Take the thickness and depth as indicated by drawings. Deduct openings. Commence at one corner and measure towards the right.]

Walls.
East side....43 ft. 6 in.
North " ..44 ft. 3 in.
West " ..50 ft. 3 in.
South " ..38 ft. 6 in. } x 1 ft. 9 in. x 4 ft. = 1,235.50 cu. ft.

Footings.
In cellar walls..182 ft. 0 in.
Un. piers. 17 ft. 6 in. } x 2 ft. 6 in. x 10 in. = 415.62 cu. ft.

Plinth found'n.
South street...247 ft.
Main street.... 70 ft.
Walks..... 77 ft. } x 2 ft. x 2 ft. 9 in. = 2,167.00 cu. ft.

3,818.12 cu. ft.

Deduct cellar door 2 ft. 6 in. x 1 ft. 9 in. x 4 ft. = 17.5 cu. ft.
3,818.12 — 17.5 = 3,800.62 cu. ft.

3,800.62 cu. ft. ÷ 24.75 = 153.5 perches, at $3.76 = ..... 577.06

*Analysis of Price per Perch of Rough Stone.*

1 man can lay 4 perch per day; wages being $2 75, laying 1 perch will cost.....$0.69
1 laborer for 2 stonemasons; wages being $1.75, labor for 1 perch will cost..... .22
Stone..... 1.10
Half bushel lime..... .15
One-third cartload screened gravel..... .30
Half barrel cement..... 1.00
Carting (quarry ¼ mile distant)..... .30

Total cost per perch.....$3.76

Amount forward.....$577.06

Amount brought forward.....$577.06

CESSPOOL.

At per perch of 24.75 cu. ft.

[To find the contents of cesspool masonry. From the contents of the outer diameter, subtract the contents of the inner diameter, and multiply by the hight of wall.]

Outer diam..... 1 ft. 6 in. + 1 ft. 6 in. + 6 ft. = 9 ft.
Inner diam..... = 6 ft.
No. of cu. ft. = $9^2$ x .7854 = 63.6174 cu. ft.
No. of cu. ft. = $6^2$ x .7854 = 28.2744 cu. ft.

35.3430 cu. ft.

35.343 cu. ft. x 8 ÷ 24.75 = 11.42 perches, at $2.43 =.... 27.75

*Analysis of Cost per Perch.*

Laying stone.....$0.69
Stone..... 1.00
Carting..... .30
Laborer..... .44

Total cost per perch.....$2.43

GRANITE PLINTH.

At per lineal ft., finished and set.

[Take the net length of plinth.]

388 ft. lin., 10 in. x 15 in. plinth, at $1.50 =..... 582.00

BLUE STONE.

At per piece, delivered.

Planed.
Sills, 9 ps., 7 in. x 7 in., 3 ft. 0 in. lg., at $0.75 each. = 6.75
Sills, 1 p., 3 in. x 12 in., 3 ft. 0 in. lg., at $1.50 each. = 1.50
Heads, 9 ps., 5 in. x 7½ in., 3 ft. 3 in. lg., at $0.75 each. = 6.75

Sawed.
Steps, 6 ps., 3 in. x 10 in., 3 ft. 0 in. lg., at $1.25 each. = 7.50
Coping, 2 ps., 3 in. x 14 in., 3 ft. 0 in. lg., at $1.50 each. = 3.00

1 cesspool top, 3 in. x 2 ft. 8 in. x 2 ft. 8 in..... 2.00
1 catch-basin top, 4 in. x 4 ft. 2 in. x 4 ft. 2 in..... 5.00
1 cistern top, 3 in. x 2 ft. 8 in. x 2 ft. 8 in..... 2.00
Labor.—Cutting 3 holes in stone for grating at $1 =.. 3.00
Cutting 1 hole in platform at 50¢ =..... .50
Setting stone steps and coping..... 5.00 — 43.00

COBBLE STONES FOR FOUNDATIONS.

At per perch of 24.75 cu. ft.

182 ft. lin.-ft. footings, 2 ft. 6 in. x 10 in. = 379.1 cu. ft.
379.1 cu. ft. ÷ 24.75 = 15.31 perches, at $2.90 =..... 44.37

*Analysis of Cost per Perch.*

Stone..... $1.50
Carting..... .40
Putting in and ramming..... 1.00

Total cost per perch..... $2.90

PLASTERING WALLS WITH CEMENT.

At per sq. yd. of 9 sq. ft.

184 ft. x 2 ft. 9 in. = 506 sq. ft. 506 ÷ 9 = 56.2 sq. yds., at 30¢ =..... 16.86

*Analysis of Cost per Yard.*

Half bushel cement..... 25¢
Labor..... 05¢

Total cost per yard..... 30¢

Total of Masonry.....$1291.04

## Brickwork.

[For all straight facework, find the superficial measurement on one side of wall, and multiply by 7 for each brick of 4 inches in thickness. For circular walls find the contents of wall in cu. ft. and multiply by 21. Deduct openings. To find the length of wall measure on a line drawn through the center.]

UNDERPINNING, BRICK FOOTINGS, CHIMNEYS, CISTERNS AND CESSPOOL.

At per M laid.

[Take chimneys solid.]

Underpinning.
East.... 43 ft. 6 in.
North... 45 ft. 0 in.
West.... 23 ft. 6 in.
West.... 27 ft. 6 in.
South... 37 ft. 6 in. } x 3 ft. 6 in. x 21 times = 13,009

Area..... 13 ft. x 4 ft. 0 in.
Area..... 7 ft. x 3 ft. 6 in.
Cellar.....102 ft. x 7 ft. 9 in. } x 14 times =.... 12,238

Ashpits..... 9 ft. x 7 ft. 9 in. x 7
Chimneys.....37 ft. x 3 ft. 6 in. x 28 } x 3 times = 12,942

Footings.
Chimneys..... 43 ft. 6 in. x 1 ft. 6 in.
Cellar....102 ft. 0 in. x 0 ft. 7 in.
Area..... 13 ft. 0 in. x 0 ft. 7 in. } x 21 times = 3,229
Piers..... 3 ft. 0 in. x 1 ft. 6 in.
Furnace.... 4 ft. 0 in. x 4 ft. 0 in. } M 41,418

Deductions, 9 win... 2 ft. 6 in. x 3 ft.
1 door... 2 ft. 9 in. x 3 ft. } x 21 times = 1,590
3 doors.. 6 ft. 8 in. x 3 ft.
5 doors.. 6 ft. 8 in. x 5 ft. } x 14 times = 3,161

M 4,751

41,418 — 4,751 = M 36,669, at $15.27 = .....$559.90

Amount forward.....$559.90

Amount brought forward.....$559.90

*Analysis of Cost per M Laid (Rough Work)*

| | |
|---|---|
| Brick | $10.00 |
| 2⅓ bushels lime | .70 |
| ⅓ load bar sand | .40 |
| ¼ bbl. cement | .67 |
| 1 man can lay 1 M per day; wages being $3, laying | 3.00 |
| 1 laborer to 4 bricklayers, wages being $2, labor | .50 |
| Total cost per M | $15 27 |

Extra on face work in red mortar:

South side..... 30 ft. 6 in.
West side..... 23 ft. 6 in.
North side..... 32 ft. 0 in.
Area..... 13 ft. 0 in.
} x 3 ft. 6 in. x 7 times = 2,425

7 ft. x 3 ft. 6 in. x 14 times = ..... 343

M 2,768

M 2,768, at $2.95 = ..... 8.16

*Analysis of Additional Cost per M.*

| | |
|---|---|
| Extra time in laying 1 M | $1.20 |
| To 1 M brick, 70 loads, at 2½¢ | 1.75 |
| Total additional cost | $2 95 |

CISTERN.

Outer diam..... = 8 ft. + 9 in. + 9 in., = 9 ft. 6 in.
Inner " ..... = 8 ft.

$9\frac{1}{2}^2 \times .7854 = 70.882$ cu. ft.
$8^2 \times .7854 = 50.265$ cu. ft.

20.617 = number of cu. ft. in cistern for every foot in hight.

20.617 x 9 ft. x 21 = M. 3.896, at $17.80 = ..... 69.34
[Analysis of cost below.]

CATCH BASIN, ETC.

Outer diam. = 3 ft. 6 in. + 9 in. + 9 in. =. ... 5 ft. 0 in.
Inner diam. = 3 ft. 6 in.

$5 \text{ ft. } 0^2 \text{ in.} \times .7854 = 19.635$
$3 \text{ ft. } 6^2 \text{ in.} \times .7854 = 9.621$

10.014 = number of cu. ft. of wall for every ft. in hight:

| | |
|---|---|
| 10.014 x 6 ft. x 21 = | 1,261 |
| Cistern top.... 9 ft. $6^2$ in. x .7854 x 9 in. x 21 = | 1,116 |
| Cesspool " .... 9 ft. $0^2$ in. x .7854 x 9 in. x 21 = | 1,001 |
| Catch-basin top 5 ft. $0^2$ in. x .7854 x 9 in. x 21 = | 309 |
| | 3,687 |

3,687 brick at $17.80 =..... 68.83

*Analysis of Cost per M Laid in Clear Cement.*

| | |
|---|---|
| 1 man can lay 700 per day, wages being $3, to lay 1 M will cost.. | $4.30 |
| 1 laborer to 2 bricklayers; wages being $2, labor per 1 M will cost | 1.50 |
| 3 bbls. cement at $2 = | 6.00 |
| Brick | 6.00 |
| Total cost per M laid in cement | $17.80 |

CONCRETE FLOOR.

At per sq. yd. of 9 sq. ft.

[Take entire surface of cellar, making no allowance for walls, &c.]

North part of cellar.. 43 ft. 6 in. x 22 ft.
South " .. 33 ft. 0 in. x 15 ft.
B. w. south " .. 13 ft. x 3 ft. 6 in.
B. w., s. e. " .. 9 ft. x 2 ft.
} = 1,515½ sq. ft.

1,515½ sq. ft. ÷ 9 = 168 sq. yds., at 51¢ = ..... 85.68

*Analysis of Cost per Yard..*

| | |
|---|---|
| 1 bbl. Newark cement | $2.00 |
| 4 bbls. sand | .44 |
| | $2.44 |

3 in. thick will cover 6 sq. yds.

| | |
|---|---|
| Sand and cement for 1 sq. yd | 41¢ |
| Labor, mixing and spreading | 29¢ |
| Total cost per yard | 51¢ |

SUNDRIES.

| | |
|---|---|
| Cleaning brickwork | $3.00 |
| 4 terra-cotta tops, at $5 | 20.00 |
| 1 " panel | 6.00 |
| | 29.00 |

Total Brickwork.....$820.91

## Carpenter Work.

[Under this head include rough lumber, flooring, siding, shingling, matched boards and planed lumber on exterior; measure at per M ft. superficial.

For number of joists required, take the length of building, subtract ¼, and add 1 to the result, when set 16 in. on centers. For length of joist take width of building. No allowance for openings.

In calculating rafters in roofs where hips occur, take the side of roof straight through, as the angle that is cut off by hip rafter, will fill up the other side. This applies to angles made by hip rafters, when the plates are at right angles to each other. Get the number of rafters the same as for joists when set 16 in. on centers; if placed 18 in. on centers, deduct ⅓; if 24 in., deduct ½, adding 1 to either result.

Find the length of hip rafter the same as the hypothenuse of a right-angled triangle.

Find the number of pieces of studding the same as for joists.

In measuring the sheathing put the different roofs, &c., in the easiest possible forms for calculation, such as triangles, squares, trapezoids, by including a portion of roof twice, if necessary, and deduct afterward. Deduct all openings; keep the portions of roof, floors, sides, &c., separate if covered with different materials, as this done accurately the number of shingles, siding, &c., are easily calculated.]

WHITE PINE.

| | | Th. | Bdth. | Lgth. | |
|---|---|---|---|---|---|
| Joists, 1st story. | N. s., 35 ps., | 2 in. x | 11 in., | 24 ft. | = 2,469 ft. |
| | S. w., 12 ps., | 2 in. x | 11 in., | 20 ft. | |
| | S. e., 15 ps., | 2 in. x | 11 in., | 16 ft. | |
| | Heads, 1 p., | 3 in. x | 11 in., | 18 ft. | |
| Joists, 2d story. | N., 35 ps., | 2 in. x | 10 in., | 24 ft. | = 2,240 ft. |
| | S. w., 12 ps., | 2 in. x | 10 in., | 20 ft. | |
| | S. e., 15 ps., | 2 in. x | 10 in., | 16 ft. | |
| | He'ds, 1 p., | 3 in. x | 10 in., | 16 ft. | |
| Joists, attic. | N., 35 ps., | 2 in. x | 9 in., | 24 ft. | = 2,016 ft. |
| | S. w, 12 ps., | 2 in. x | 9 in, | 20 ft. | |
| | S. e., 15 ps., | 2 in. x | 9 in., | 16 ft. | |
| | He'ds, 1 p., | 3 in. x | 9 in., | 16 ft. | |
| Joists, piazza | 20 ps., | 2 in. x | 6 in., | 16 ft. | |
| " laundry | 11 ps., | 3 in. x | 4 in., | 16 ft. | = 536 ft. |
| " " | 4 ps., | 3 in. x | 4 in., | 10 ft. | |
| Posts | 12 ps., | 4 in. x | 8 in., | 24 ft. | = 3,176 ft. |
| " | 3 ps., | 4 in. x | 8 in., | 20 ft. | |
| Sills | 1 p., | 6 in. x | 8 in., | 180 ft. | |
| " | 1 p., | 6 in. x | 6 in., | 76 ft. | |
| Girts | 1 p., | 4 in. x | 6 in., | 212 ft. | |
| Plates | 1 p., | 4 in. x | 6 in., | 148 ft. | |
| Cellar plates | 1 p., | 3 in. x | 8 in., | 176 ft. | |
| Porch plates | 1 p., | 4 in. x | 9 in., | 76 ft. | |
| Rftrs.–Main roof from N. to S. | 56 ps., | 2 in. x | 9 in., | 22 ft. | = 4,679 ft. |
| | 4 ps., | 3 in. x | 10 in, | 26 ft. | |
| Rafters.—South roof from E. to W. | 12 ps., | 2 in. x | 9 in., | 12 ft. | |
| | 16 ps., | 2 in. x | 9 in., | 12 ft. | |
| | 2 ps., | 3 in. x | 10 in., | 16 ft. | |
| Rafters.—Over kitchen. | 32 ps., | 2 in. x | 9 in., | 18 ft. | |
| | 2 ps., | 3 in. x | 10 in., | 24 ft. | |
| Rafters.—Bays and Dormers. | 6 ps., | 2 in. x | 8 in., | 14 ft. | |
| | 4 ps., | 2 in. x | 9 in., | 10 ft. | |
| | 21 ps., | 2 in. x | 6 in., | 12 ft. | |
| Rftrs.—Ridge pole | 1 p., | 2 in. x | 13 in., | 38 ft. | |
| Rafters.—Porch | 18 ps., | 2 in. x | 8 in., | 16 ft. | |
| | 3 ps., | 2 in. x | 8 in., | 14 ft. | |
| Raftrs.—Roof post | 1 p., | 4 in. x | 8 in., | 14 ft. | |
| Studding.—Sides | 90 ps., | 2 in. x | 4 in., | 22 ft. | = 1,872 ft. |
| " —Sides | 36 ps., | 2 in. x | 4 in., | 20 ft. | |
| " —Gabels | 6 ps., | 2 in. x | 4 in., | 18 ft. | |
| | | | | 16,988 ft. | |

16,988 ft. white pine, at $22 per M = .....$373.73

HEMLOCK.

| | | | |
|---|---|---|---|
| Studding. 1st story. | 55 ps., | 2 in. x 4 in., | 20 ft. |
| | 11 ps., | 2 in. x 3 in., | 20 ft. |
| 2d story. | 67 ps., | 2 in. x 4 in., | 18 ft. |
| | 9 ps., | 2 in. x 3 in., | 18 ft. |
| Attic. | 25 ps., | 2 in. x 4 in., | 16 ft. |
| | 28 ps., | 2 in. x 3 in., | 16 ft. |

= 2,513

Bridging.—303 ft. 2 in. x 4 in.

Sheathing for walls, &c., under siding 180 ft. x 12 ft. 6 in. =..... 2,250 ft.

| | | Length. | Breadth. | | |
|---|---|---|---|---|---|
| Deduct | 2 openings | 7 ft. 6 in. | x 6 ft. 0 in. | = 462 ft. | |
| " | 10 " | 7 ft. 6 in. | x 3 ft. 0 in. | | |
| " | 1 " | 5 ft. 0 in. | x 4 ft. 6 in. | | |
| " | 1 " | 5 ft. 0 in. | x 4 ft. 6 in. | | |
| " | 1 " | 5 ft. 0 in. | x 2 ft. 0 in | | 1,788 |
| " | 1 " | 7 ft. 6 in. | x 5 ft. 0 in. | | |
| " | 1 bay " | 11 ft. 0 in. | x 7 ft. 0 in. | | |
| Underside Shingling. Sides | | 127 ft. 0 in. | x 10 ft. 6 in. | = 1,920 ft. | |
| " | | 53 ft. 0 in. | x 8 ft. 0 in. | | |
| Gables | | 16 ft. 0 in. | x 9 ft. 0 in. | | |
| Dormers | | 3 ft. 0 in. | x 3 ft. 0 in. | | |
| Deduct | 1 opening | 6 ft. 6 in. | x 5 ft. 6 in. | = 383 ft. | |
| " | 2 " | 6 ft. 6 in. | x 3 ft. 6 in. | | |
| " | 4 " | 6 ft. 6 in. | x 3 ft. 0 in. | | |
| " | 1 " | 6 ft. 6 in. | x 6 ft. 0 in. | | |
| " | 3 " | 4 ft. 6 in. | x 3 ft. 0 in. | | 1,537 |
| " | 2 " | 4 ft. 6 in. | x 2 ft. 0 in. | | |
| " | 1 bay " | 11 ft. 0 in. | x 7 ft. 0 in. | | |
| " | 1 dor. " | 6 ft. 0 in. | x 5 ft. 0 in. | | |
| " | 1 " " | 5 ft. 6 in. | x 3 ft. 6 in. | | |

On Roofs.

| | | | | |
|---|---|---|---|---|
| N. to s | 39 ft. 6 in. | x 22 ft. 0 in. | x 2 | = 3,531 ft. |
| E. and w | 13 ft. 0 in. | x 12 ft. 0 in. | x 2 | |
| Over kitchen | 16 ft. 0 in. | x 18 ft. 0 in. | x 2 | |
| " | 18 ft. 0 in. | x 4 ft. 6 in. | x 2 | |
| N. dor | 4 ft. 0 in. | x 5 ft. 0 in. | x 2 | |
| Bay | 6 ft. 0 in. | x 2 ft. 6 in. | x 2 | |
| " | 6 ft. 0 in. | x 7 ft. 0 in. | | |
| " | 7 ft. 0 in. | x 2 ft. 6 in. | x 3 | |
| S. & w. dor. | 5 ft. 0 in. | x 3 ft. 0 in. | x 6 | |
| " " | 5 ft. 0 in. | x 1 ft. 6 in. | x 2 | |
| Piazza | 15 ft. 0 in. | x 8 ft. 0 in. | | |
| " | 16 ft. 0 in. | x 7 ft. 0 in. | | |
| " | 23 ft. 0 in. | x 9 ft. 0 in. | | |
| " | 5 ft. 6 in. | x 6 ft. 6 in. | x 2 | |
| Deduct main roof N. to S. | 18 ft. | x 6 ft. 0 in. | x 2 | = 380 ft. |
| | 7 ft. | x 4 ft. 0 in. | x 2 | |
| Deduct roof E. and W. | 8 ft. | x 4 ft. 0 in. | | 3,151 |
| | 8 ft. | x 2 ft. 6 in. | | |
| | 16 ft. | x 3 ft. 6 in. | | |

Amounts forward....8,989 ft..$373.73

Amounts brought forward.....8,989 ft $373.73

Under floors.— Laundry. { 16 ft. 3 in. x 15 ft. 3 in. / 8 ft. 0 in. x 4 ft. 0 in. } = 280

Under floors.— 1st & 2d stories. { 44 ft. 6 in. x 23 ft. 0 in. / 32 ft. 0 in. x 15 ft. 0 in. / 15 ft. 0 in. x 3 ft. 6 in. / 11 ft. 0 in. x 4 ft. 0 in. } x 2 = 3,200

3d story..... { 32 ft. 0 in. x 12 ft. 0 in. / 22 ft. 0 in. x 16 ft. 0 in. / 23 ft. 0 in. x 18 ft. 0 in. } = 1,152

13,621

Calculations kept separate for different kinds of flooring. (See flooring.)

13,621 ft. hemlock, at $16 per M = ..... 217.93

MATCHED BOARDS.

Add 1-5th for waste.

Yellow Pine.

Cornices.—Main..243 ft. 0 in. x 3 ft. 0 in.
" Dormer. 38 ft. 0 in. x 1 ft. 6 in.
" Piazza.. 15 ft. 0 in. x 1 ft. 6 in.
" Piazza.. 43 ft. 0 in. x 1 ft. 6 in. } = 872 ft.

Hoods.—1 Hood.. 6 ft. 0 in. x 5 ft. 0 in.
" 9 Hoods. 4 ft. 6 in. x 3 ft. 6 in.
" 1 Hood.. 3 ft. 0 in. x 3 ft. 6 in. } = 182 ft.

Ceilings.—Piazza. 15 ft. 0 in. x 8 ft. 0 in.
" Piazza. 16 ft. 0 in. x 7 ft. 0 in.
" Piazza. 23 ft. 0 in. x 9 ft. 0 in. } = 439 ft.

1,493 ft.

Calculations for cornices and hoods are kept separate in order to keep the surface covered by different cut shingles.

1,493 ft. + 1/5 = 1,791 ft., at $25 per M = ..... 45.77

Yellow Pine, "See Hemlock," "under floors."

Flooring.-Laundry.16 ft. 3 in. x 15 ft. 3 in.
" " 8 ft. 0 in. x 4 ft. 0 in.
" Kitchen..23 ft. 0 in. x 17 ft. 0 in.
" " 8 ft. 0 in. x 4 ft. 0 in.
" Bathroom 9 ft. 0 in. x 5 ft. 0 in.
" Bil. room.16 ft. 0 in. x 10 ft. 0 in.
" " 7 ft. 0 in. x 3 ft. 0 in. } = 929 ft.

929 ft. + 1/5 = 1,115 ft., at $27 per M = ..... 30.10

White-pine flooring.

1st story..... 23 ft. x 19 ft. 0 in.
" ..... 18 ft. x 8 ft. 0 in.
" ..... 32 ft. x 15 ft. 0 in.
" ..... 15 ft. x 3 ft. 6 in.
" ..... 11 ft. x 4 ft. 0 in.
2d story..... 46 ft. x 23 ft. 0 in.
" ..... 32 ft. x 15 ft. 0 in.
" ..... 15 ft. x 3 ft. 6 in.
" ..... 11 ft. x 4 ft. 0 in. } = 2,792 ft.

Deduct, 2d story..... 9 ft. x 5 ft. 0 in. = 45 ft.

2,747

2,747 ft. + 1/5 = 3,296 ft., at $30 per M =..... 98.88

Siding—For surface, take the same number of sq. ft. as in hemlock under siding.

1,788 sq. ft. + 1/5 = 2,146 sq. ft., at $28 per M =..... 60.08

SHINGLING.

At per M.

Side Shingling—For surface, take the same number of sq. ft. as in sheathing. Refer to hemlock, under side shingling, and to matched boards on hoods. 1,537 sq. ft. of side surface added to 182 sq. ft. of hood surface = 1,719 sq. ft. Laid 7 in. to the weather, it will require 3½ shingles to each sq. ft.

1,719 sq. ft. x 3½ = 6,016 shingles, at $22 per M = $132.35

Roof Shingling—For surface, take the same number of sq. ft. as in sheathing. Refer to hemlock sheathing on roofs and to matched boards for cornices. 3,151 sq. ft. of surface on roofs added to 872 sq ft. of surface in cornices = 4,023 sq. ft. Laid 6 in. to the weather, it will require 4 shingles, 6 in. wide, to the sq. ft.

4,023 sq. ft. x 4 = 16,092 shingles, at $18 per M. = 289.65

422.00

PLANED LUMBER ON EXTERIOR.

4/4 yellow pine.

Roof on bay..... 36 ft.
Floors for piazzas . ..... 417 ft.
Steps..... 60 ft.
Balconies and dormer..... 32 ft.

545 ft.

545 sq. ft., at $35 per M = ..... 19.07

4/4 white pine.

Steps. ..... 56 ft.
Casings around piazzas..... 81 ft.
Cornice..... 358 ft.
Screens, casings and aprons..... 60 ft.

555 ft.

555 ft., at $32 per M =..... 17.76

5/4 white pine.

Base..... 130 ft.
String course..... 340 ft.
Gable pediments..... 95 ft.

565 ft.

565 sq. ft. at $30 per M = .... ..... 16.95

53.78

Amount forward.....$1302.27

Amount brought forward.....$1302.27

BRIDGING FOR JOISTS, GROUNDS, ETC.

At per ft. lineal :

Bridging.....250 lin. ft. 1 x 3, rough, at 1¢ per ft. = $2.50
Grounds.....500 lin. ft. 1 x 3, pl'nd., at 1¼¢ " = 6.25
For wainscot...600 lin. ft. 1 x 3, " at 1¼¢ " = 7.50

16.25

LABOR.

[For labor in rough carpenter work, take 50 per cent. of the cost of material.]

Material—White pine..... $373.73
" Hemlock..... 217.93
" Matched Boards—Cornices, &c..... 45.77
" " Yellow pine flooring.. 30.10
" " White pine " .. 98.88
" " Siding..... 60.08
" Shingling..... 422.00
" Planed pine..... 53.78
" Bridging and grounds..... 16.25

$1318.52

50 per cent. of $1318.52 = ..... 659.26

Total Carpenter Work..... $1977.78

## Millwork.

[First find the cost of making the millwork. Take solid cubic measure, and double the cost of material, for the price per piece, per sq. ft. or per 1 in. of 100 ft. Exceptions are noted (see sash). For labor putting up the millwork, take 25 per cent. of the cost of same, which includes putting on all hardware.]

FRAMES.

| At per piece. | | | In. | | | |
|---|---|---|---|---|---|---|
| 1st story, | 13 | w. f., | 2 ft. 8 in. x 7 ft., | 1¾, | at $2.94 = | $38.22 |
| " | 6 | " | 1 ft. 6 in. x 7 ft., | 1¾, | at 2.64 = | 15.84 |
| " | 3 | " | 1 ft. 6 in. x 5 ft., | 1¾, | at 2.10 = | 6.30 |
| 2d story, | 12 | " | 2 ft. 8 in. x 6 ft., | 1½, | at 2.64 = | 31.68 |
| " | 4 | " | 2 ft. 0 in. x 6 ft., | 1½, | at 2.52 = | 10.08 |
| " | 4 | " | 1 ft. 6 in. x 6 ft., | 1½, | at 2.40 = | 9.60 |
| " | 2 | " | 1 ft. 6 in. x 5 ft., | 1½, | at 2.10 = | 4.20 |
| Attic, | 2 | " | 2 ft. 6 in. x 3 ft., | 1½, | at 1.80 = | 3.60 |
| " | 2 | " | 2 ft. 6 in. x 5 ft., | 1½, | at 2.40 = | 4.80 |
| " | 4 | dor.fr. | 2 ft. 0 in. x 3 ft., | 1½, | at 1.68 = | 6.72 |
| Basement, | 9 | w. f., | 2 ft. 6 in. x 3 ft., | 1½, | at 1.80 = | 16.20 |

147.24

*Example of Cost of Frame :*

Size of frame 2 ft. 8 in. x 7 ft.

7 ft. 3 ft. 6 in.
2 ft. 3 ft. 6 in.

14 ft. length of jambs. 7 ft. 0 in. length of head and sill.
7 ft. " head and sill.

21 lin. ft. box. Size of box of frame = 4 in. x 7 in. = 2⅓ ft.
2⅓ No of ft. in 1 ft.

49 ft. = ft. lumber, at 3¢ per ft. = $1.47.
$1.47 doubled = $2.94, cost of frame.

BLINDS.

At per pair.

| | | | | | |
|---|---|---|---|---|---|
| Outside blinds, 1st story— | | | | | |
| 13 pr., | 2 ft. 8 in. x 7 ft., | 1½ | white pine, | at $2 24 = | $29.12 |
| 6 pr., | 1 ft. 6 in. x 7 ft., | 1½ | " | at 1.38 = | 8.28 |
| 3 pr., | 1 ft. 6 in. x 5 ft., | 1½ | " | at .90 = | 2.70 |
| Outside blinds, 2d story— | | | | | |
| 12 pr., | 2 ft. 8 in. x 6 ft., | 1½ | " | at 1.92 = | 23.04 |
| 4 pr., | 2 ft. 0 in. x 6 ft., | 1½ | " | at 1.44 = | 5.76 |
| 4 pr., | 1 ft. 6 in. x 6 ft., | 1½ | " | at .72 = | 2.88 |
| 2 pr., | 1 ft. 6 in. x 5 ft., | 1½ | " | at .90 = | 1.80 |
| Inside blinds, basement— | | | | | |
| 9 set, | 2 ft. 6 in. x 3 ft., | 1⅛ | w.p., 4 fold, | at 1.20 = | 10.80 |
| Inside blinds, attic— | | | | | |
| 2 set, | 2 ft. 6 in. x 3 ft., | 1⅛ | " | at 1.20 = | 2.40 |
| 2 set, | 2 ft. 6 in. x 5 ft., | 1⅛ | " | at 2.00 = | 4.00 |
| 4 set, | 2 ft. 0 in. x 3 ft , | 1⅛ | w.p., 3 fold, | at .96 = | 3.74 |

94.52

*Example of Cost of Outside Blinds :*

Size of blind, 2 ft. 8 in. x 7 ft., 1½ in. w. p.

2 ft. 8 in. width by
7 ft. 0 in. hight.

18 ft. 8 in.
1½ by thickness.

28 ft. 0 in. = number of ft.
.04 per ft.

$1.12
2

$2.24 cost of blind.

*Inside Blinds.*

Find same as for outside blinds, and multiply by the number of folds :

Size 2 ft. 6 in. x 3 ft.
3 ft.

7 ft. 6 in. number of ft. of surface.
.04 per ft.

.30 cost of material.
4

$1.20 cost of blind.

Amount forward.....$241.76

Amount brought forward.....$241.76

SASH AND TRANSOMS.

At per piece, or 1 frame of sash.

1st story—
13 pr. sash, 1¾ in., 14 in. x 38 in., 4 lt. at $1.28 = $16.64
6 pr. sash, 1¾ in., 14 in. x 38 in., 2 lt., at .80 = 4.80
3 pr. sash, 1¾ in., 14 in. x 26 in., 2 lt., at .64 = 1.82

2d story—
12 pr. sash, 1½ in., 14 in. x 32 in., 4 lt., at 1.16 = 13.92
4 pr. sash, 1½ in., 30 in. x 32 in., 2 lt., at .80 = 3.20
4 pr. sash, 1½ in., 14 in. x 32 in., 2 lt., at .72 = 2.88
2 pr. sash, 1½ in., 14 in. x 26 in., 2 lt., at .64 = 1.28

Attic—
2 pr. sash, 1½ in., 13 in. x 14 in., 4 lt., at .76 = 1.42
2 pr. sash, 1½ in., 13 in. x 26 in., 4 lt., at 1.00 = 2.00
4 pr. sash, 1½ in., 10 in. x 14 in., 4 lt., at .56 = 2.24

Sides of dormers—
4 pr. sash, 1½ in., 8 in. x 10 in., 9 lt., at .76 = 3.04

Partition—
1 pr. sash, 1½ in., 10 in. x 14 in , 6 lt., at .64 = 3.84

Basement—
9 pr. sash, 1½ in., 14 in x 14 in., 4 lt., at .76 = 6.84
4 transoms, 1½ in., 14 in. x 14 in., 1 lt., at .24 = .96
2 transoms, 1½ in., 14 in. x 22 in., 1 lt., at .32 = .64
2 transoms, 2 in., 1 ft. 6 in. x 5 ft., 1 lt., ash; size of glass, 14 x 56 in., at $1.04 = ..... 2.08

Winter sash, 1st story—
13 sash, 2 ft. 8 in. x 7 ft., 1½ in., w. p., at 1.28 = 16.64
6 sash, 1 ft. 6 in. x 7 ft., 1½ in., w. p., at .80 = 4.80
3 sash, 1 ft. 6 in. x 5 ft., 1½ in., w. p., at .64 = 1.92

90.96

*Example of Cost of Sash :*

1 pr. sash, 1¾ in., 14 in., x 38 in. 4 lt., w. p.

When the contents of the section of a piece of millwork do not = 6 in., take same as 6 in.; if over, take 1 ft

2 ft. 9 in. x 4 rails in each sash.
4

Length of rails.... 2 ft. 9 in — 11 ft. 0 in length of rails.
" stiles... 7 ft. 0 in. — 14 ft. 0 in. " two stiles.
" muntin. 7 ft. 0 in. — 7 ft. 0 in. " muntin.

32 ft. 0 in lin. ft. bars, &c.
6 x area of section.

16 ft. 0 in. = contents in ft.
.04

.64 cost of material.
No section = 6 in ..... $0.64 doubled.
Take same as if 6 in..... 2

$1.28 cost.

DOORS.

At per piece.

1st story and basement—
1 pr. front doors, 5 ft. x 7 ft. 6 in., 2 in. ash, at....$15.00
1 pr. vestibule doors, 5 ft. x 7 ft. 6 in., 2 in. ash, glass in top panel, at ..... 15.00
1 pr. sliding doors, 6 ft. x 7 ft. 6 in., 1¾ in., ash, flush molded, 7 panels, at..... 15.80
1 pr. parlor doors, 4 ft. 6 in. x 7 ft. 6 in., 2 in. ash, raised mold, 7 panels, at ..... 13.50
2 doors, 3 ft. x 7 ft. 6 in., 2 in. ash, raised mold, 7 panels, at $9 = ..... 18.00
2 doors, 3 ft. x 7 ft. 6 in., 2 in. ash 1 side and pine on other, raised mold, 7 panels, at $6.50 = ... 13.00
6 doors, 2 ft. 8 in. x 7 ft., 1½ in. pine, flush molded, 4 panels, at $2.80 = ..... 16.80
2 doors, 3 ft. x 7 ft., 2 in. pine, flush molded, 4 panels, at $4.20 = ..... 8.40
3 doors, 2 ft. 6 in. x 7 ft., 1½ in. pine, flush molded, 4 panels, at $2.64 = ..... 7.92
3 doors, 2 ft. x 5 ft., ⅞ in. pine, sash in panels, at $1 = ..... 3.00
2 doors, 1 ft. 6 in. x 2 ft., ⅞ in. pine, plain raise molded, at 60¢ = ..... 1.20
4 pr. doors, 2 ft. 6 in. x 2 ft., ⅞ in. pine, plain raise molded, at 75¢ = ..... 3.00

2d story and attic—
4 doors, 2 ft. 8 in. x 7 ft. 3 in., 1¾ in. ash 1 side, 10 panels, at $6 = ..... 24.00
4 doors, 2 ft. 6 in. x 7 ft. 3 in., 1½ in. ash 1 side, 10 panels, at $4 = ..... 16.00
2 doors, 2 ft. 8 in. x 7 ft. 3 in., 1½ in. pine, d. f., 10 panels, at $3.40 = ..... 6.80
5 doors, 2 ft. 8 in. x 7 ft., 1½ in. pine, d. f., 4 panels, at $2.80 =... ..... 14.00
1 door, 2 ft. 6 in. x 7 ft., 1½ in. pine, S. F., 4 panels, at $2.64 = ..... 2.64

194.06

JAMB CASINGS AND WINDOW CAPS.

At per lin. ft.

572 lin. ft. ⅞ in. x 6 in. pine, at 4¢ =.....$22.88
46 " ⅞ in. x 4 in. ash, at 6¢ =..... 2.76
160 " ⅞ in. x 6 in. ash, at 8¢ =..... 12.80

38.44

ARCHITRAVES.

At per in. of 100 ft.

1st story—
531 lin. ft., 5½ in. x 1 in. ash, = 2,920 ft.
407 " 4½ in. x 1 in. pine, = 1,831 ft.

Amounts forward ...2,920 ft..1,831 ft..$565.22

Amounts brought forward....2,920 ft..1,831 ft..$565.22

2d story—
111 lin. ft., 5½ in. x 1 in. ash, = 610 ft.
250 " 5½ in. x 1 in. pine, = 1,375 ft.
260 " 4½ in. x 1 in. pine, = 1,170 ft.

Attic and basement—
324 lin. ft., 4½ in. x 1 in. pine, = 1,458 ft.

3,530 ft. 5,834 ft.

3,530 ft. of an in. sq., at $1.66 per 1 in. of 100 ft. =$58.59
5,834 ft. of an in. sq., at .84 per 1 in. of 100 ft. = 49.00

107.59

PLINTHS AND CORNER BLOCKS.

At per piece.

Plinths, 1st story—
26 ps., 1½ in. x 9 in. x 6 in. ash, at 20¢ = $5.20

Plinths, 2d story—
12 ps., 1 in. x 9 in. x 6 in. ash, at 20¢ = 2.40
18 ps., 1 in. x 9 in. x 6 in. pine, at 10¢ = 1.80

Blocks, 1st story—
52 blocks, 3½ sq. x 1⅛ in. ash, at 10¢ =... 5.20
76 blocks, 4½ sq. x 1⅛ in. pine, at 5¢ =... 3.80

18.40

BASE.

At per lin. ft.

1st story—
109 lin. ft., 1 in. x 12 in. ash, at 20¢ per ft. =$21.80

2d story—
153 lin. ft., 1 in. x 11 in. w. p., at 9¢ per ft. = 13.77

2d story, 161 lin. ft., ⅞ in. x 9 in., w. p. } at 7¢ per
Attic, 134 " ⅞ in. x 9 in. " } ft. = 22.12

57.69

DADO.

At per sq. ft.

Ash { Din'g-room. 44 ft. x 3 ft. 6 in. / Hall..... 92 ft. x 3 ft. 3 in. / Vestibule... 10 ft. x 3 ft. 3 in. / 2d story.... 58 ft. x 3 ft. 3 in. } = 674 sq. ft. at 20¢ per sq. ft. = 134.80

WAINSCOTING.

At per superficial ft. Add ¼ for waste.

Bathroom, 24 ft. x 4 ft., ash, ½ in. thick = ..... 96 ft.
Basement and kitchen, 210 x 3 ft., pine, ½ in. thick = 630 ft.
96 ft. ash + ¼ = 120 ft., at 5¢ = ..... $6.00
630 ft. ash + ¼ = 787 ft., at 2½¢ = ..... 19.68

25.68

STAIRWAYS.

Front steps.—Take items separately at per piece, &c.

336 ft. hemlock at 2¢ = ..... $6.72
300 ft. ash, ⅘ and ⅝, at 10¢ = ..... 30.00
45 lin. ft. 3 x 4 ash rail, at 20¢ = ..... 9.00
45 lin. ft. 1¾ x 2 ash rail, at 10¢ = ..... 4.50
47 small balusters, at 10¢ = ..... 4.70
47 large balusters, at 25¢ = ..... 11.75
47 brackets, at 20¢ = ..... 9.40
1 newel post, ash, at $15 = ..... 15.00
9½ corner newels, 4½ x 4½, at $5 = ..... 47.50
45 lin. ft. 1 x 3½, middling, at 6¢ = ..... 2.70
1 panel or spandril..... 2.50
Carving..... 25.00

168.77

Rear steps—
220 ft. hemlock, at 2¢..... $4.40
130 ft. yellow pine, at 4¢..... 5.20
15 lin. ft. cherry rail, at 25¢..... 3.75

13.35

Wooden arch in hall—
25 ft. ash, at 10¢ = ..... $2.50
8 ft. rail, ash, at 20¢ = ..... 1.60
12 balusters, ash, at 15¢ = ..... 1.80
2 brackets, ash, at $1 = ..... 2.00

7.90

BATH TUB.

Ash. { 1 panel, 2 ft. x 5 ft., ⅞ in. thick, at $1 = ..... $1.00 / 1 panel, 2 ft. x 2 ft., ⅞ in. thick, at 40¢..... .40 / 1 panel, 1 ft. 6 in. x 2 ft. 6 in., ⅞ in. thick, at 40¢. .40 / 1 lid and stiles, 1 ft. 9 in. x 2 ft. 6 in., ⅞ in. thick, at 60¢ = ..... .60 / 10 ft. cap, ⅞ in., at 10¢..... 1.00

3.40

PLANED LUMBER FOR INTERIOR.

White-pine shelving, &c.

Pantry. ..... 115 ft. shelving and stiles.
China closet.... 155 ft. " "
Dish closet..... 35 ft. " "
Linen closet... 125 ft. " "
Chamber closet. 55 ft. " "
Washstands.... 40 ft. " "

525 ft., at 8¢ per ft. = .....$42.00
64 ft. ½ in. poplar for washstands, at 6¢..... 3.84

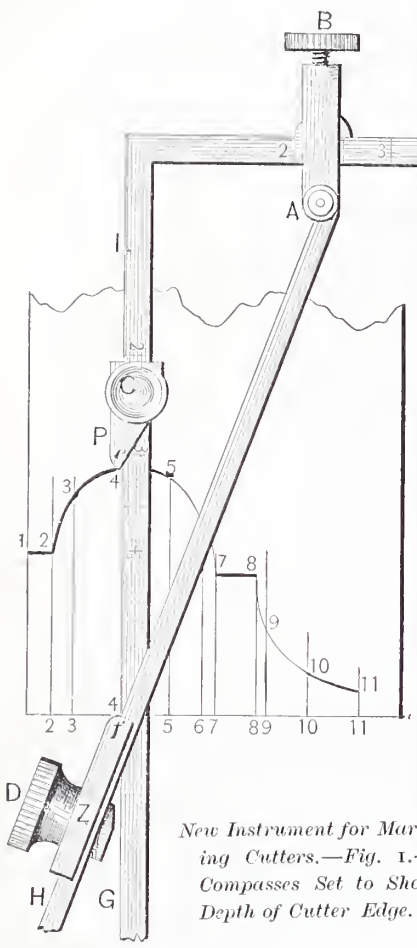
45.84

Footings of Millwork carried forward..... $1148.64

*(Concluded next month.)*

## Shape of Cutters for Molding Machines.

The general subject indicated in the title of this article was discussed in our correspondence columns some months since without exhausting it. Indirectly, the letters from our readers had the effect of calling out a very important article upon the mathematical principles underlying the formation of molding cutters, and which, although intended for publication in our columns, has not as yet been presented, simply from lack of space. Inasmuch as the question is of interest to the makers of machinery quite as much as to the users of it, the article, after being held several months, was finally published in *Mechanics* (also issued at this office), and appeared in that periodical bearing date April 21. The article is somewhat lengthy, filling nearly three pages the size of this, and being illustrated with 11 diagrams. Following this presentation of the subject, to which those of our readers who are specially interested




*New Instrument for Marking Cutters.—Fig. 1.—Compasses Set to Show Depth of Cutter Edge.*

in principles are referred, there appeared in a subsequent issue of *Mechanics* a description of an instrument for marking out cutters for molding machines which has recently been put upon the market. It was shown in the first article referred to that cutters for every different size of molding-machine head or cutter bar required a different shape to produce the same form of molding. It was also shown that the depth of cutter-head necessary to form a given depth of molding varies with the distance of the molding from the cutter-head, and that as a result every member of a molding requires a different depth of cutter edge, notwithstanding that all the members may measure the same depth. It follows that, where a standard or an exact form of molding is required, great care is necessary in forming the cutters, which is usually regarded as a very skillful piece of workmanship, and therefore intrusted either to the foreman or some one of the most expert workmen. Not infrequently the plan is adopted of making the cutter edge deeper than the depth of molding member in the proportion of 1-16th inch per inch, and the errors thus induced are corrected by testing the cutter in the machine. This is obviously an expensive process, requiring much patience as well as skill if correct results are to be obtained.

The tool above referred to was designed by Mr. G. M. Drummond, of 48 West Thirteenth street, New York City, and is used in connection with an ordinary pair of compasses. Its construction, which is clearly illustrated in the accompanying engravings,

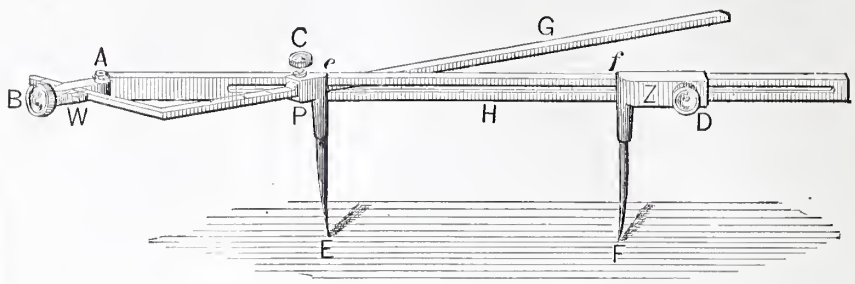



*Fig. 2.—General View of Instrument.*

is such that the depth of cutter edge for any member of the molding may be found at once for any size of cutter-head, and any depth of molding by properly adjusting the different members. It consists essentially of a bar, G, upon which is a slide, W, secured by the set-screw B, and having at A a pivot to carry the end of a second bar, H. Upon G is also a slide, P, carrying a compass point, E, this slide being secured in its adjusted position upon the bar by set-screw *e*.

In using the instrument but three very simple operations are necessary. First, the two slides W and P are set to the numerals 2, 3, &c., on the bar, which correspond to the size of the head on the molding machine the cutter is to be used upon. Thus, in Fig. 3 they are shown set to numeral 2, as they would be for a two-inch cutter head. The instrument is next opened, its two bars occupying the position shown in Fig. 3, and the two compass points are set to the hight of the molding or to any desired member of it, as the case may be. The bars are then opened out into the position shown in Fig. 1, and the compass points at once give the depth of cutter edge necessary to produce the required depth of molding. The admirably simple manner in which the instrument overcomes what has proved in the workshop

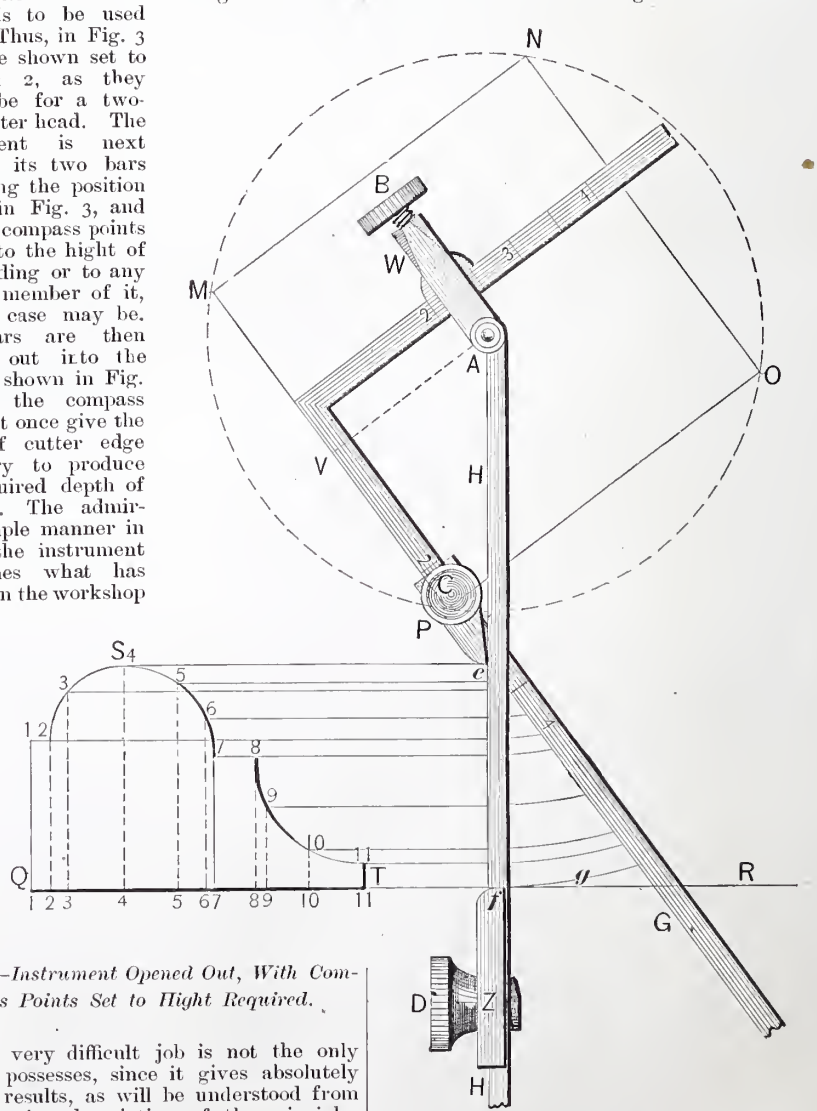



*Fig. 3.—Instrument Opened Out, With Compass Points Set to Hight Required.*

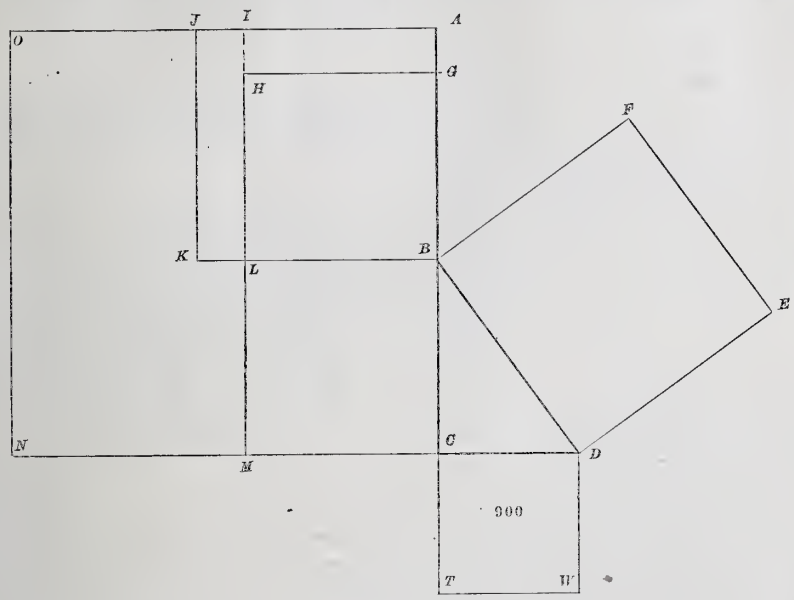
to be a very difficult job is not the only merit it possesses, since it gives absolutely correct results, as will be understood from the following description of the principles involved in its construction:

In Fig. 3, M N O P represent the four corners of a cutter-head whose center of revolution is at the center of pivot A. Suppose, then, that the horizontal line Q R represents the surface of the table on which the molding slides when it is being cut to shape, and the face of H being at a right angle to line Q R, and passing through the center of pivot A, it therefore represents the line upon which the cutter acts when forming the molding, the cutting action that takes place on either side of this line simply serving to remove the surplus material. Obviously, then, the two compass points (which stand vertically beneath the points *e* and *f*, and parallel to and even with the face of bar H) measure the depth of molding that will be cut, because point *e* stands at the highest point and *f* at the lowest point of cutter action. On closing the instrument the point *f* describes the arc of a circle, *g*, and stands exactly level with the face of bar G, and from *e* to the intersection of arc *g* with the face of bar G is the length of cutter edge necessary to cut a molding whose depth is radius *e f* in the figure. The instrument being thus set, its bars are closed with the fingers, and the instrument is applied to the cutter or to the paper pattern from which the cutter is to be made, marking thereon the correct depth. It is obvious that in setting the instrument for the various members or to the division lines on the molding—or, rather, on the drawing of the same—all that is necessary is to adjust slide Z, since P must remain in the adjusted position for the size of head the cutter is to be used upon.

## CORRESPONDENCE.

### Problem of Right Angle Triangle.

*From* S. R. K., *Grand Rapids, Mich.*—Referring to the problem of a right-angle triangle, raised by a correspondent of *Carpentry and Building* some months since, respecting a tree which shall break at a certain point in its hight, the top just reaching the ground at a given distance from the base, J. A. G., of Hornellsville, N. Y., asks for a geometrieal demonstration of the rule, which may be stated as follows: From the square of the hight of the tree subtract the square of the base, and divide the remainder by twice the hight of the tree. I offer the following as a brief demonstration of the rule, and also of the rule presented by the correspondent who asks this question: Referring to Fig. 1 of the accompanying diagrams, let A C be the tree and C D the distanee the top is to touch the ground from the foot of the tree. Then D B C will equal A C. Now, the square of D B, or its equal A B, is equal to the square of B C plus the square of C D. If we take the square of B C, or its equal L B G H, from the square A B K J we will have left the parallelograms G A I H and I J K L equal to the square of C D; but A I equals B C and J K equals A B; hence the parallelograms are together equal in length to the hight of the tree, and are in width equal to the difference in the length of B D and B C; hence, dividing the square of C D by the hight of the tree gives the differenee of the sides B D and B C. Referring now to Fig. 2, A C N O being the square of A C, J O equals B C and M N equals A B, or, in other words, the parallelogram I T S M is equal to the square of C D. If we take this parallelogram away, we have two parallelograms equal in length to the hight of the tree, and in width equal to the side B C; hence, if from the square of the hight of the tree we subtract the square of the base and divide the remainder by 2, and this by the hight of the tree, we have the side B C.




*Problem of Right-Angle Triangle.—Fig. 1.—Accompanying Letter from S. R. K.*

### Fire-Proof Shutters.

*From* W. P. M., *Georgetown, Canada.*—Will you kindly inform me what kind of a shutter you consider the best protection from fires in factories? What is the usual method of fastening these to brick walls?

*Answer.*—A wooden door made by two thicknesses matched of boards crossing each other, well nailed with wrought nails and clinched, and then covered with sheet tin or galvanized iron carefully locked and tacked on so as to cover the wood on both sides, is the very best shutter known to the fire-insurance companies. Usually castings are put into a brick wall when the walls are built, having pintels to receive the hinges. These shutters will resist fire longer than iron, and will not warp nor spring so as to permit the fire to gain entrance inside. The shutters are usually kept in place when closed by a bar across the windows and staples or latches inside. This holds them securely, even though the hinges should be burned off or entirely destroyed.

### Warping of Drafting Boards.

*From* PALMETTO, *Jacksonville, Fla.*—I have taken many valuable hints from *Carpentry and Building*, and I wish to contribute my mite to the general information presented. Those who have used drafting boards appreciate their liability to warp under various conditions of atmosphere. It is also pretty well known that almost fabulous prices are demanded for good drafting boards at the hands of dealers. I have discovered a method by which an ordinary drafting board can be constructed that will remain in good condition. I had some large detail drawings to make in California many years ago, and, being a carpenter, I made a board for the purpose in the quickest manner I could. I glued the joints, and as battings suggested themselves, I employed them in its construction. The board measured about 40 x 80 inches in size. I dressed one side and cut three beveled-edged battings and fitted them to one-half the thickness of the board—in other words, I dovetailed them in such a manner as would allow them to slide and not interfere with the shrinkage of the board, and then went to work with my drawings. In a few days I was compelled to stop, as my board had warped ¾ inch, taking the battings with it. I then grooved the under side one-half the thickness of the board at distances of 2 inches. The grooves run in the opposite direction to the battings, or with the grain of the board. When this was done I found that I had the most perfect drawing board I had ever used. I think others will find the suggestion advantageous.

### Blanks for Estimating.

*From* W. & S., *Philadelphia, Pa.*—The accompanying list was made up and printed after some little trial of it in a written form. We find it very good for the purpose, and, should you consider it worth publishing, it may be of benefit to others in the trade:

Estimate for..... .....188

| | Memorandum of quantities. | Estimate. | Bid. | Cost. | Profit. |
|---|---|---|---|---|---|
| Grading..... | | | | | |
| Excavating..... | | | | | |
| Stone..... | | | | | |
| Mason ..... | | | | | |
| Cut stone. ..... | | | | | |
| Brick... ..... | | | | | |
| Bricklayer..... | | | | | |
| Range..... | | | | | |
| Heaters..... | | | | | |
| Heat pipes..... ... | | | | | |
| Registers..... | | | | | |
| Mantels..... | | | | | |
| Tile floors..... | | | | | |
| Grates..... ..... | | | | | |
| Outhouse..... | | | | | |
| Pavements..... .. | | | | | |
| Carpenter ... .. ... | | | | | |
| Lumber. ..... | | | | | |
| Porches..... ..... | | | | | |
| Wood fence..... | | | | | |
| Millwork..... | | | | | |
| Hardware..... | | | | | |
| Painting and glazing | | | | | |
| Plaster..... | | | | | |
| Plumbing ..... | | | | | |
| Gas pipes..... | | | | | |
| Gas fixtures ..... | | | | | |
| Slate roof..... | | | | | |
| Tinwork ..... | | | | | |
| Galvanized iron..... | | | | | |
| Iron fence..... | | | | | |
| Mortar floor..... | | | | | |
| Hauling..... | | | | | |
| Labor work... ..... | | | | | |
| Permits..... .... | | | | | |
| Paper hanging ..... | | | | | |
| Expenses..... | | | | | |
| Plans ..... ... | | | | | |

*Note.*—The accompanying blank with our correspondent's letter, which we have endeavored to reproduce above, measures in the original 4 by 7 inches. The ruling upon which the items are printed, and in which the memoranda of quantities and prices, &c., are to be extended, is ⅛ inch between lines. This is much finer than most con tractors and builders would care to work. There is nothing, however, about the form which would prevent its being printed in larger type and with more liberal ruling should any one desire it.

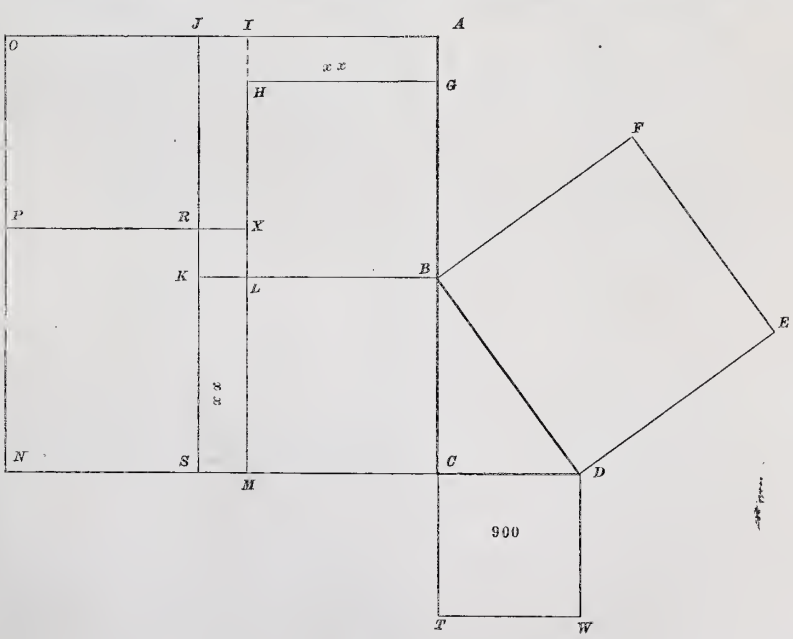
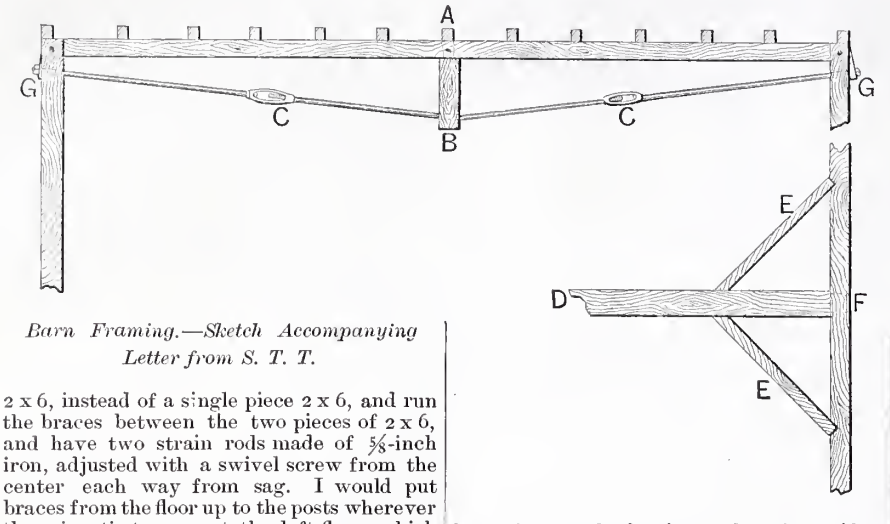



*Fig. 2.—Accompanying Letter from S. R. K.*

### Barn Framing.

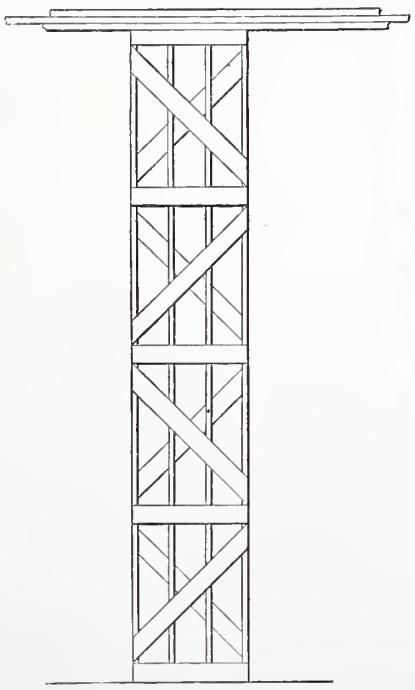
*From* S. T. T., *Chester, Pa.*—By the accompany sketches, readers of *Carpentry and Building* will understand my plan to do away with the studding shown in "Buffalo Lake's" building, published some months since. His supports for hay-loft I would brace in the form indicated in the accompanying drawing. I would use two pieces of




*Barn Framing.—Sketch Accompanying Letter from S. T. T.*

2 x 6, instead of a single piece 2 x 6, and run the braces between the two pieces of 2 x 6, and have two strain rods made of ⅝-inch iron, adjusted with a swivel screw from the center each way from sag. I would put braces from the floor up to the posts wherever there is a tie to support the loft floor, which would be about 10 feet apart. The use of a swivel in connection with the strain rods is to tighten up or spring the timber or tie for holding the rafters.

*From* J. B., *New Buffalo, Dak.*—Referring to the article of "Buffalo Lake," in a recent issue of *Carpentry and Building*, I would suggest that, instead of setting the stud at E every 2 feet, he should make lattice posts, as indicated by Fig. 1 of my sketches, using for the purpose studding 2 x 6 inches, and fencing stuff 6 inches wide for braces and cross-pieces. Place these posts, say, 10 feet apart, measured from center to center. This would leave openings about 7 feet between them, through which the hay could be passed to the side divisions. This would cut out almost all of the braces F. To support the 24-foot rafters, I would set in a line of posts under the center, made similar



*Barn Framing.—Fig. 1.—Construction of Lattice Supports, Recommended by J. B.*

to those shown in Fig. 1, only using two pieces, 2 x 6, instead of four. On one side of these studs at the top I would check in a strong piece, 2 x 6, for carrying the rafters. The stud pieces of these posts could be set up singly and stayed as ordinary studding is stayed. After the plates or strong pieces were spiked on, the lattice pieces could be put on.

There is an old saying that it is not wise to put all your eggs into one basket, and I would advise "Buffalo Lake" to put up another building rather than add to the present one. This will undoubtedly cost more, but he will find a saving in time in using his horse-fork, and what is worthy of consideration and still more important, if an infectious disease should get into his herd, he will find a separate building of great value. If he concludes to act upon this advice, I would suggest that he shorten his studding posts to 16 feet, and put in 14-foot rafters, instead of 12-foot, over the center division. This would still leave the fork-bar as high up, while the thrust on these rafters would not tend so much to spread the building. I would set the rafters on the main studding as indicated in my sketch, Fig. 2. Though I am farming, I enjoy *Carpentry and Building* very

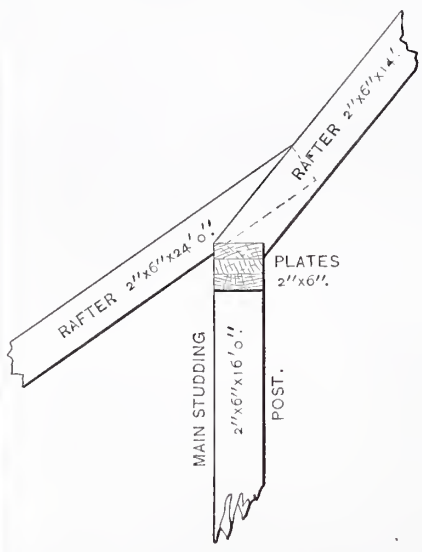



*Fig. 2.—Sketch Illustrating Second Suggestion from J. B.*

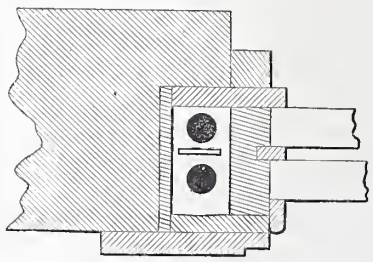
much, and derive much benefit from it. I feel that it is a privilege to add my mite to the general stock of information it contains

### Characteristics of the Figure 9.

*From* F. M. S., *Hickory, Miss.*—The peculiar properties of the figure 9, published in back numbers of the paper and contributed by D. F. H., of Topeka, Kan., and others, arise from our system of notation. The figure in question is one less than the radix, and is the highest number that can be expressed by a single digit. The law that the sum of the digits of the several products equals the figures multiplied pervades 9 and 3, the latter because 3 is a factor of 9. If the sum of the digits in any number is a multiple of 9, the number itself is a multiple of 9. If the sum of the digits in any number is a multiple of 3, the number likewise is a multiple of 3. Dividing any number by 9 or 3 will leave the same remainder as dividing the sum of its digits by 9 or 3. If 9 were the basis of our system, these properties would belong to 8, 4 and 2. If 8 were the basis of the system, they would belong to 7 only, since 7 has no factors. Let the radix be any number whatever, the number one less than it and all of its factors will possess just such properties, and this by a law. There are no accidental properties in numbers. Dr. Wallis, of England, applied this principle for proving the correctness of operations by the rules of arithmetic, and his method is commonly known as "casting out the 9's." The principle involved is the key to many numerical puzzles. These, like magic squares, are of no practical use.

### Box Window Frames.

*From* T. V. S., *Wheeling, W. Va.*—The inclosed sketches of the construction of box window frames were prepared in answer to



*Box Window Frames.—Fig. 1.—Horizontal Section Through a Box Window Frame for a Brick Building.—Scale, ¾-Inch to the Foot.*

"Alabama Carpenter," whose inquiry was published some months since. It illustrates the manner of making frames of the kind named in this vicinity. The sketches represent a horizontal section through a box frame for both brick and frame house. The parts are so clearly shown that further description is hardly necessary.

### Holcomb's Patent Hip Roof.

*From* F. H. S., *Gardner, N. Y.*—I desire to inquire if the Holcomb patent hip roof has ever been described in *Carpentry and Building*. If so, please refer to the numbers in which it appeared. If it has not been described, I should be pleased to have it illustrated.

*Answer.*—The Holcomb patent hip roof was discussed in the correspondence department of this journal in our volume for 1879. Our correspondent is referred to page 198 of the issue for October of that year, and also

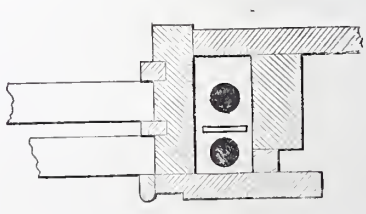


*Fig. 2.—Horizontal Section Through a Box Window Frame for a Frame Building.—Scale, ¾-Inch to the Foot.*

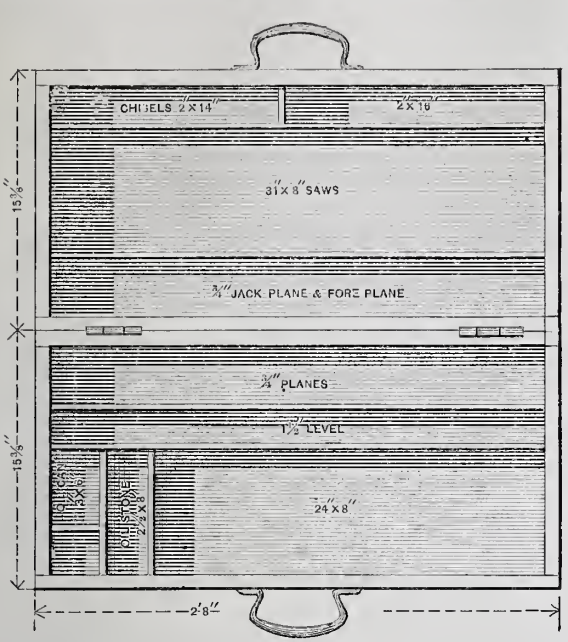
to page 38 of the February issue, and pages 95 and 96 of the May issue for the year 1880.

### Scribing Skirting.

*From* APPRENTICE, *Nashville, Tenn.*—On page 100 of *Carpentry and Building*, current volume, W. W. P., of Fairfield, Ohio, asks about an instrument for scribing skirting on stairs. In Peter Nicholson's volume, published by George Virtue, of London, about 35 years ago, on page 48, those who are interested in this subject will find illustrated the very thing wanted. The device is very simple, and costs nothing but a little time to make. My father has had occasion to use this instrument frequently, and it answers his purpose satisfactorily.

### Hand-Box for Tools.

*From* E. H. P., *Marshall, Mo.*—I have noticed several inquiries for a hand-box for tools. I forward the accompanying sketch, showing a device of this kind. The construction is such that the box will fit in between the tills of a tool-chest, thereby making the whole compact when moving the chest around. The box is quite conveinent




*Hand-Box for Tools.—Fig. 1.—Top View of Box Opened.*

in transporting tools where it is not necessary to take the chest. The dimensions and divisions are so clearly shown that further description is not considered necessary.

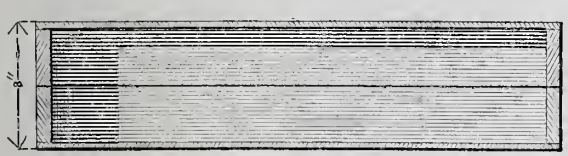



*Fig. 2.—Longitudinal Section Through Box when Closed.*

### Stock Water-Tank.

*From* W. B., *Ames, Iowa.*—I inclose a sketch of a stock water-tank which may be of interest to some of the readers of *Carpentry and Building* who have occasion to construct such work. A is the tank, B and C

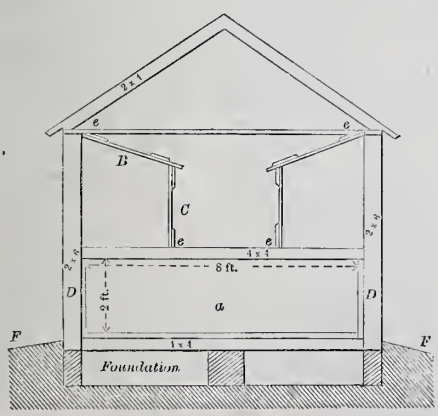



Fig. 1.—Cross Section.

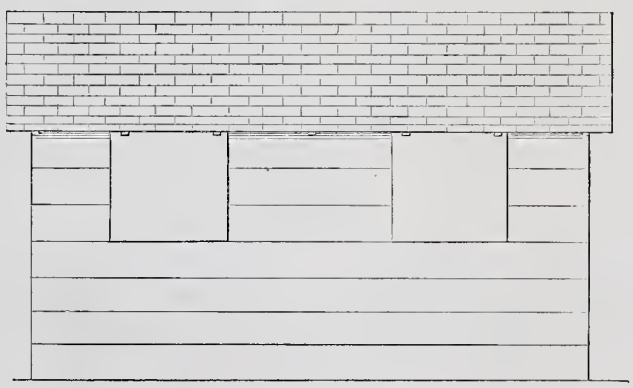


Fig. 2.—Side Elevation.

*Design for Stock Water-Tank.—Contributed by W. B.—Scale, $\frac{3}{16}$ Inch to the Foot.*

the doors open. B rests on C, being hinged at the top. In closing, C is shut first, then B, which may be fastened on the outside. Sawdust filling is used at D between the studding, which are 2 x 6 in size. A considerable space can be covered over the tank not used for doors. The approaches can be graded up or planked as shown at F. I built a tank on this plan some four years since, which has been in use since that time. It did not freeze until the doors, by forgetfulness, had been left open. The tank can be located near a windmill and connected with a pump, a waste-pipe being provided to prevent overflow.

### Calculating the Strength of Floors.

*From* J. R. S., *Maysville, Ky.*—Will you please recommend, through the department of "Correspondence" in *Carpentry and Building*, some work giving rules for figuring the strength of floors for greenhouses, &c.? If the matter has ever been treated in the columns of *Carpentry and Building* I shall be pleased to have it pointed out. As indicating my wants at the present time, I will state that I have a floor the joists of which are 2½ x 12 inches, 16 feet long, and placed 16 inches between centers. How many pounds to the joist will be a safe load to put upon the floor, the weight being regularly distributed? What will be the breaking weight, the timber being thoroughly dry and put in place without relishing?

*Answer.*—Although questions of this kind have been briefly discussed in back numbers of *Carpentry and Building*, little has appeared that will be of direct benefit to our correspondent in the problem he has in hand. So much is involved in the calculation of questions of this kind that it is very difficult to give the information desired without entering into an extended discussion of mathematical principles. In other words, there is a deal more mathematical knowledge required than is ordinarily possessed by the average reader of a technical journal like this. Answering our correspondent's first question, we would recommend him to examine Hatfield's two volumes, one entitled "American House Carpenter," which contains, among other things, an exposition of various mathematical principles underlying such calculations as a builder is required to make. The second volume, by the same author, is entitled "Transverse Strains," and discusses problems practically and theoretically of the character about which our correspondent inquires. The price of these books is $5 each, and they may be ordered through this office if desired. The various engineering handbooks, among which may be mentioned "Nystrom's Engineers' Pocket Book," price $3.50, and "Haswell's Engineers' and Mechanics' Pocket Book," price $3, will also be found of service in connection herewith. They contain many tables and formulæ that may be employed advantageously in calculations of this kind.

### Method of Obtaining Length of Rafters.

*From* S. R. K., *Grand Rapids, Mich.*—For some months past there has been quite a discussion of various plans for obtaining the length of rafters. Many of the methods presented are not desirable, for the want of accuracy. Some years ago the subject came up for discussion where I was at work, and I then prepared the following table, which is very simple and mathematically correct. Any mechanic can copy it on the back of a business card and tack it to the lid of his tool-chest, where it will always be handy for reference. The word "pitch" means such a fractional part of the width of the building. The further north you go the steeper the pitch, on account of the snow; also certain localities have pitches peculiar to that section of the country:

| Pitch. | Square. | Rafter. | Brace. |
|---|---|---|---|
| 1/6 | 4 and 12 | 0.527046 | 1.054092 |
| 5/24 | 5 and 12 | 0.541666⅔ | 1.083333 |
| 1/4 | 6 and 12 | 0.559017 | 1.118034 |
| 7/24 | 7 and 12 | 0.578852 | 1.157704 |
| 1/3 | 8 and 12 | 0.600925 | 1.201850 |
| 3/8 | 9 and 12 | 0.625 | 1.25 |
| 5/12 | 10 and 12 | 0.6508541 | 1.3017082 |
| 11/24 | 11 and 12 | 0.6782843 | 1.3565686 |
| 1/2 | 12 and 12 | 0.7071068 | 1.4142136 |

The first column indicates the pitch of the roof; the second gives the figures on the square that will cut the various pitches; the third gives the length of a rafter for a building 1 foot wide, and the fourth gives the length of braces for runs of the same proportion as the figures in the second column.

The manner of using the table is as follows: For any given pitch multiply the tabular number by the whole width of the building, and the product will be the length of the rafter in feet and decimals of a foot.

*Example.*—What is the length of a rafter of a building 18 feet wide at ⅓ pitch?

*Solution.*—0.600925 × 18 = 10.81665 feet, or 10 feet 9$\frac{13}{16}$ inches.

*Example.*—What is the length of a brace having 40 x 48 inch run?

*Solution.*—40 x 48 inches is the same proportion as 10 x 12; hence, 1.3017082 × 48 = 62.482 inches, or 62½ inches, always using the longest run for multiplier.

*Example.*—What is the length of a brace having 35 x 35 inch run?

*Solution.*—1.4142136 × 35 = 47.4974 inches, or 49½ inches.

## REFERRED TO OUR READERS.

### Veneered Houses.

*From* S., *Little Rock, Ark.*—Will some of the practical readers describe the manner of building veneered houses, by which is meant frame inside and brick outside, so frequently seen in Wisconsin, Minnesota and other portions of the country. From what I have observed and heard of building construction of this kind, I think it is well adapted for this locality. If not too much trouble, I should like full information concerning foundations and frame, how the latter is built, the manner of tying the brickwork to the frame, and what precaution, if any, is necessary to pre-

vent the brickwork from settling away from the frame, how to ventilate the walls, and the comparative cost.

*Note.*—Our correspondent is so careful to enumerate the various points about which he desires information that there is little that we can add to his question. However, if our readers are disposed to discuss this topic, we suggest that an additional feature that should be considered is the general utility of the plan of construction indicated, and that those who have given the subject practical test should state whether or not they recommend it for general use. Some of our readers who have written upon this topic in the past have been free with their criticisms, and it is possible that many may think that the general plan is one of questionable utility for general use. We leave the subject to our readers, and trust it will be thoroughly discussed.

### Laying Hardwood Floors.

*From* W. H. *Republic, Mich.*—I desire to learn, through *Carpentry and Building*, the best manner of laying and securing hardwood flooring, and also the best method of cleaning off and polishing the same.

### Scaffolding.

*From* T. O. A., *Fort Meade, Fla.*—Why can we not have a discussion in *Carpentry and Building* as to the best methods of constructing light and heavy hanging scaffolds, such as are used by painters, carpenters and tinners, where the workmen are swung from the cornice, roof or other convenient places for the purpose, and which are used in place of expensive staging.

*Note.*—The reply to this question is that the matter is in the hands of our readers. A discussion of scaffolding and staging at the hands of practical men would undoubtedly be interesting and profitable, and we shall be glad to have contributions on the subject.

### Barn Door Nomenclature.

*From* F. H. S., *Gardner, N. Y.*—I desire to inquire what is the proper name for the upright to which a pair of double barn doors are fastened when shut, and also I desire to know the name of the small roof over the same doors. If some practical reader of the paper will answer this question he will confer a favor.

### Siding Gauge.

*From* J. H., *Memphis, Kan.*—I desire to know if there is any tool in the market adapted for use as a siding gauge, which will mark the joints ready for sawing. It should be knife and hook combined. I have not seen anything of the kind; hence the inquiry.

### Deadening a Floor.

*From* M. A. C., *Richmond, Ind.*—We desire to learn through *Carpentry and Building* the best practical way of deadening a floor, or some description of the different methods of accomplishing this work from which we can choose. The floor to be deadened is the ground floor, without a cellar underneath. The floor spoken of is not yet laid, thus making it possible to adopt any plan that may be suggested.

### Mahogany Stain.

*From* J. W. B., *Long Branch, N. J.*—Will some practical reader of the paper furnish me a recipe for staining cherry in imitation of old mahogany? What is wanted is a dark wine color.

### Designs of Lattice Work.

*From* C. E. P., *Huntington, N. Y.*—Will some reader of *Carpentry and Building* kindly furnish some new designs of lattice work suitable for use under piazzas?

**Overheated Apartments.**—Dr. William A. Hammond warns against overheated apartments. He says: "An overheated apartment always enervates its occupants. It is no uncommon thing to find rooms heated in winter by an underground furnace up to 90°. Fights and murders are more numerous in hot than cold weather, and the artificially heated air that rushes into our rooms, deprived as it is of its natural moisture by the baking it has undergone, is even more productive of vicious passions. It is no surprising circumstance, therefore, to find the woman who swelters all day in such a temperature, and adds to it at night by superfluous bed clothing, cross and disagreeable from little everyday troubles that would scarcely ruffle her temper if she kept her rooms at 65°, and opened the windows now and then."

## STRAY CHIPS.

The National Rifles, of Washington, D. C., have commenced the erection of a new armory on G street, between Ninth and Tenth. The structure will occupy a lot 68 x 114 feet in size, and will be three stories in hight. The front will be of pressed brick laid in black mortar, with molded brick trimmings and Ohio blue-stone belting, window sills, projections, &c. The center of the front will be supported by two brick columns, 2 feet wide by 4 feet deep, running to the second story, and there topped with fancy cap ornaments. In the center of the main front will be placed a large plate bearing the inscription, in galvanized letters and gilded, "National Rifles' Armory." The drill room on the first floor will be 58 x 75 feet, with a 14-foot ceiling. The principal room on the second floor will be used as a music hall, and will be 58 x 95 feet in the clear, with a 24-foot ceiling. The upper story will be divided into a billiard-room and a gymnasium, each 20 x 28 feet. The structure will be heated by four modern and solid brick furnaces situated in each corner of the basement, with hot and cold-air pipes running through flues to every room and lobby of the building. Mr. George H. Turton has been awarded the contract for the building, and Mr. John B. Brady, the district architect, who prepared the plans and specifications, will have the entire supervision of the construction. The armory, when completed, including the ground on which it stands, is estimated to cost about $36,000.

The Pullman Palace Car Co. have commenced the erection, on the southwest corner of Adams street and Michigan avenue, Chicago, Ill., of a fire-proof building to be used for the officers of that company and as flats for renting purposes. The structure will have a frontage of 121 feet on Michigan avenue and 170 feet on Adams street, and will be 10 stories in hight. The style of architecture is modern Gothic. The first and second stories will be in rock faced red granite, and the remainder in Philadelphia pressed brick and terra-cotta. An octagon tower 150 feet in hight will rise from the corner of the building. The street facades are to be supported in the main by massive polished gray granite columns with carved granite caps and bases. A feature of the building will be a large court opening on Adams street. All the halls will be tiled and finished in hardwood. There will be two elevators for the occupants of the flats and one for the officers. It is expected that the edifice will be completed by May 1, 1884. The work is being done under the supervision of Mr. S. S. Beman, the architect of the company. The cost is estimated at $500,000.

Mr Edward Malone has the contract for building the addition that is now in progress of erection to the Burnett House, situated in Toledo, Ohio. The same design as the present building will be carried out. The addition will be 34 x 100 feet in dimensions and four stories in hight. The lower floor will be occupied by the laundry, kitchen and storeroom, while the three upper floors will give an addition of 35 rooms. The cost is estimated at $20,000.

Mr. Elias Ayars, architect, of Hornellesville, N. Y., prepared the plans for the "Mission" chapel now in course of erection in that place. The structure is 50 x 26 feet in size, and built of brick and stone on a foundation of rubble. The same architect has prepared the plans for a private residence on Erie avenue for Mr. W. H. Spafford, to be constructed of brick in the Queen Anne style of architecture.

A building for cold storage, 60 x 75 feet, is now in course of erection at Sheboygan, Wis. It will be fitted up for butter, eggs and cheese, and will have the largest capacity of any similar building in Wisconsin. The ice floor, extending over the entire building, will have a capacity of 600 tons of ice. The temperature will be regulated by valves and ventilators. Mr. Henry F. Starbuck, of Chicago, Ill., is the supervising architect

Bristol, R. I., has decided to erect a fire-proof building, to be known as Memorial Hall, in honor of Gen. A. E. Burnside and the Bristol soldiers and sailors who fell in the late war. The site selected is the Pegram estate, situated on the corner of Hope and Court streets. The sum of $25,000 has been appropriated to begin the work.

Messrs. Silsbee & Kent, architects, are building a three-story private residence for Mr. Porter Norton, at Buffalo, N. Y. The first story will be constructed of pressed brick and the remaining stories of half-timber work covered with cypress shingles the latter to be coated with creosote pigment. The cost of the building, when completed, will be about $10,000.

The directors of the new Music Hall and Exposition building, at St. Louis, have decided that their capital of $500 000, already subscribed, will be insufficient to erect a building large enough to meet all the demands which are likely to be made upon it. They have therefore undertaken to add $100,000 to their working capital, and have called for subscriptions to that effect. As the whole city is enthusiastically interested in this enterprise, there is no doubt that their call will receive a hearty response.

The Plankinton House, of Milwaukee, Wis., is having an addition of 75 feet front and 200 feet deep erected that will probably cost, when completed, not far from $80,000.

The Stoddard Lock Co., manufacturers of cylinder locks, a new form of which was illustrated in *Carpentry and Building* for June, 1882, are removing their works from Bridgeport, Conn., to quarters at 104 Reade street, New York City.

The Westminster Presbyterian Church Society, of Grand Rapids, Mich., contemplate the erection of a church building adjoining their present chapel, that will cost from $15,000 to $20,000.

At Terre Haute, Ind. the corner-stone has recently been laid for a Masonic Orphans' Home, the estimated cost of which is $250,000.

The plans for a Presbyterian church, to be put up at Valparaiso, Ind., have recently been prepared by Mr. Gregory Viglant, architect, of Chicago, Ill. The structure will be of pressed brick, with stone trimmings and is estimated to cost $15,000. The same architect has also prepared plans for a Catholic church, to be erected in the town, at a cost of $30,000.

The city of St. Louis, finding its water works entirely insufficient to supply the present and prospective demand for water, has contracted for new engines and new buildings to contain them. One of these buildings was recently awarded to Messrs. Kerr & Allan, building contractors of that city, at a cost of about $30,000.

Mr. Polack, an enterprising clothier of St. Louis, is having a new store built for his accommodation, the front of which will present some novel features, consisting almost wholly of glass, with some ornamentation in brass and galvanized iron. It is expected that when illuminated at night the effect will be attractive and brilliant. Mr. Geo. J. Barnett, of St. Louis, is the architect.

At Cape May, N. J., the "New Columbia House" is undergoing quite extensive alterations to its working departments, and is also having an additional brick wing erected, 38 x 132 feet 6 inches in plan. Mr. John J. Deery, of Philadelphia, Pa., was the architect who prepared the plans.

At Newport, R. I., a three-story cottage, 40 x 40 feet in plan, is to be erected for Edwin Booth. The designs were prepared by Messrs. Vaux & Radford, of New York City. The estimated cost is $10,000.

At Pullman, Ill., a new freight-car erecting shop is now in progress of construction. The main building will be 400 x 400 feet in plan, with a wing 400 x 80 feet in size. It is estimated that the structure will require about 1,500,000 brick in its erection, and when completed will give employment to nearly 800 men. Three miles of railroad track have been laid, on which to haul the material used in the construction of the building.

Mr. F. William Rumpf is the architect under whose supervision a new brick fire-engine house is being erected in Paterson, N. J. The trimmings are red Philadelphia and Peerless molded and fancy brick, with white freestone.

Mr. J. M. Gile of Maryville, Mo., is the supervising architect of a private residence that is going up in that place for Mr. A. T. Ellis. The structure is of brick, with mansard roof, and the cost is estimated at $7000.

Messrs. Eckel & Mann of St Joseph, Mo., are the architects of a court house that is being erected at Mt. Ayr, Iowa. Mr. J. M. Gile, of Maryville, Mo., is the local superintendant. The cost is put at $40,000.

The most important building permit granted during the month of May in the city of Denver, Col., was one giving Mr. W. C. Lathrop permission to erect on the corner of Lawrence and Eighteenth streets, a "bay window front" three stories and basement in hight. The structure will be 90 x 100 feet in size, and will cost $50,000.

A store building, 75 x 150 feet in dimensions, is being put up at Colorado City, Tex, by Mr. J. Frenkel. The structure will be of brick, three stories in hight, and will cost, when completed, $24,000. Mr. S. E. Des Jardins, of Cincinnati, Ohio, was the architect who furnished the plans.

The Scovill Mfg. Co. are about putting up on Broome street, near Crosby, New York City, a building, 25 x 100 feet in size, that will be used as a factory for the manufacture of their goods. The structure will be of brick, with terra-cotta and stone finish, seven stories in hight. The cost is placed at $50,000. Messrs. D. & J. Jardine, of the same city, are the architects who prepared the plans.

Mr. W. W. Boyington is the architect who prepared the plans for the large insurance office building that is now being erected on the corner of Jackson and Quincy streets, Chicago, Ill. The structure will be 10 stories in hight on both streets. On the Jackson street front four stories will be of red granite and the remainder of red dressed sandstone. Three stories fronting on Quincy street will be of granite, while the remaining seven stories will be of red pressed brick, with terra-cotta finish. Steel floor beams and hollow-tile arches will be employed throughout the building, which is intended to be absolutely fire-proof. It is hoped that the structure will be completed within a year, and when finished will be occupied by the Royal Insurance Co., of Liverpool and London. The cost is estimated at $500,000.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=AUGUST, 1883. NUMBER 8

## A Study in Suburban Architecture.*

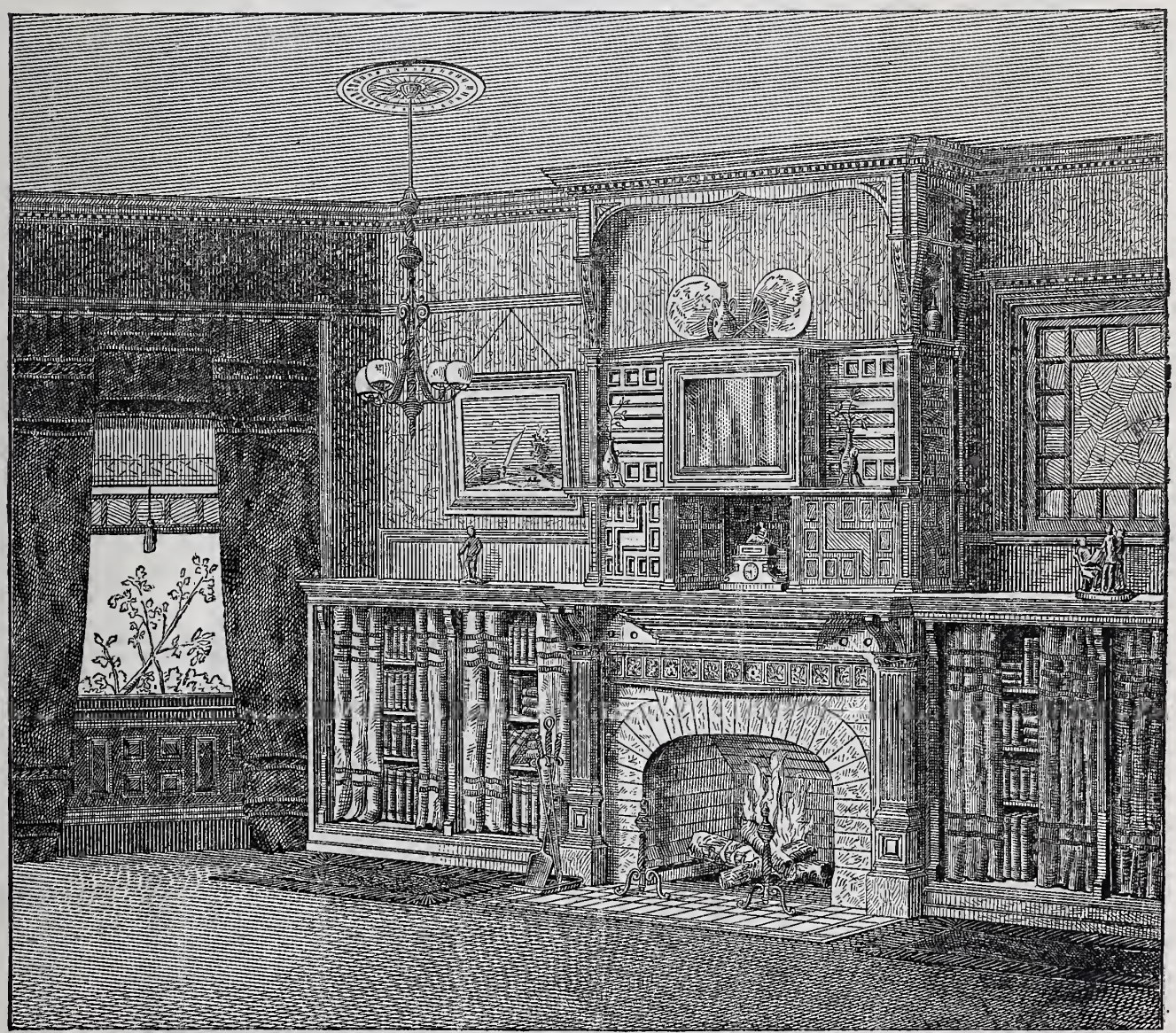
BY AN ARCHITECT.

### The Library.

It has been said of the library that it should never have the appearance of a public room in any of its arrangements, nor have the air of frivolity that might be suited to the drawing-room; that its lights should be dim and shadowy in the recesses, and an air of quiet thoughtfulness be the prevailing impression on the occupant. It is not our intention, however, although we are much in sympathy with such rooms, to follow this sentiment in the present instance. The scope of our scheme is not wide enough to admit of such a treatment of the library. Such a library must be beyond many doors, and approached, not directly from the hall, but through a corridor or ante-room, or at least a curtained lobby.

Our library opens from the hall direct, and occupies a position in the plan that might have been allotted to the parlor had we not been rather disinclined to rooms of that order. Therefore we will try to make our room partake of the characteristics of both these rooms. The general finish and furnishing of the room shall be as quiet and rich in tone as the thoughtful philosopher shall desire; yet it shall not smell of musty books, nor abound in ancient cabinets and rusty armor.

The entire woodwork of the room will be of cherry, ebonized and polished to a rich, dull gloss. As a relief to the black, a paper-hanging of embossed gold is to be used, and the curtains of the bookcases are to have an old-gold field and a deep rich border and fringe. The woodwork of the furniture will be ebony, and the upholstering of dull-green plush. The carpet will have black, dull yellow-brown and greens in its composition, and will be very quiet and unobtrusive in pattern and general tone. The pictures in this room must be choice, and not crowded. In fact, we do not like a huddle of pictures in any room; but in this, of all others, let each picture tell its quiet story. The fireplace will be surrounded with rich glazed tile in a brass frame, the over-mantel arranged with sundry little lockers and cabinets for the keeping of bric-a-brac and the like. The ceiling is to be papered with a small-pattern paper in gold, relieved with three beaded ebonized cherry bands, dividing the ceiling into irregular panels.



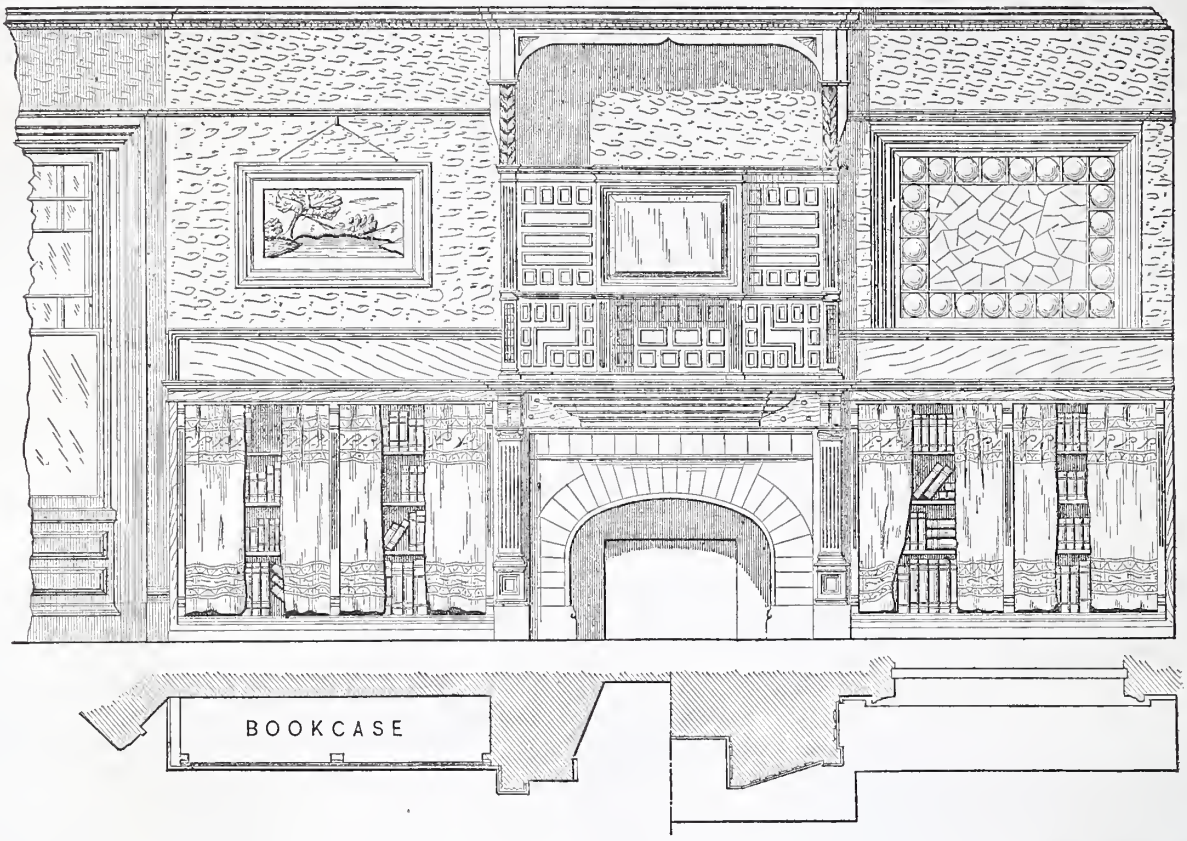
A STUDY IN SUBURBAN ARCHITECTURE.—THE LIBRARY, VIEWED FROM A POSITION NEAR THE SITTING-ROOM DOOR.

* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.

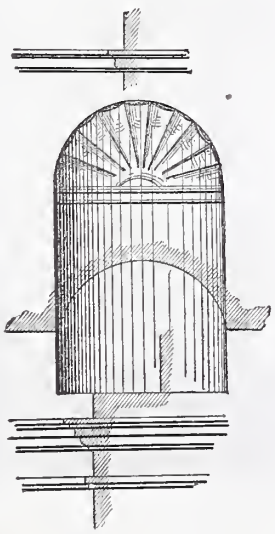
### The Twelfth Competition.

Full particulars with regard to the Twelfth Competition will be found among our advertising pages in this issue. The floor plans

upon which this contest is based were published on page 86 of our May issue to a scale of ⅛ inch to the foot, corresponding with the elevations to be drawn. The object of this contest, which has as its subject the elevations and details of a seven-room house constructed in brick, is to contrast the use of brick in buildings of this class with that of wood. A number of very fine studies were submitted in the Eleventh Competition just closed, and those who take part in the succeeding contest will have some fine specimens of what can be done in woodwork with which to compare their efforts. The decision in the Eleventh Competition will be announced in our issue for next month, and we hope at that time to present at least one of the sets of drawings which were received.

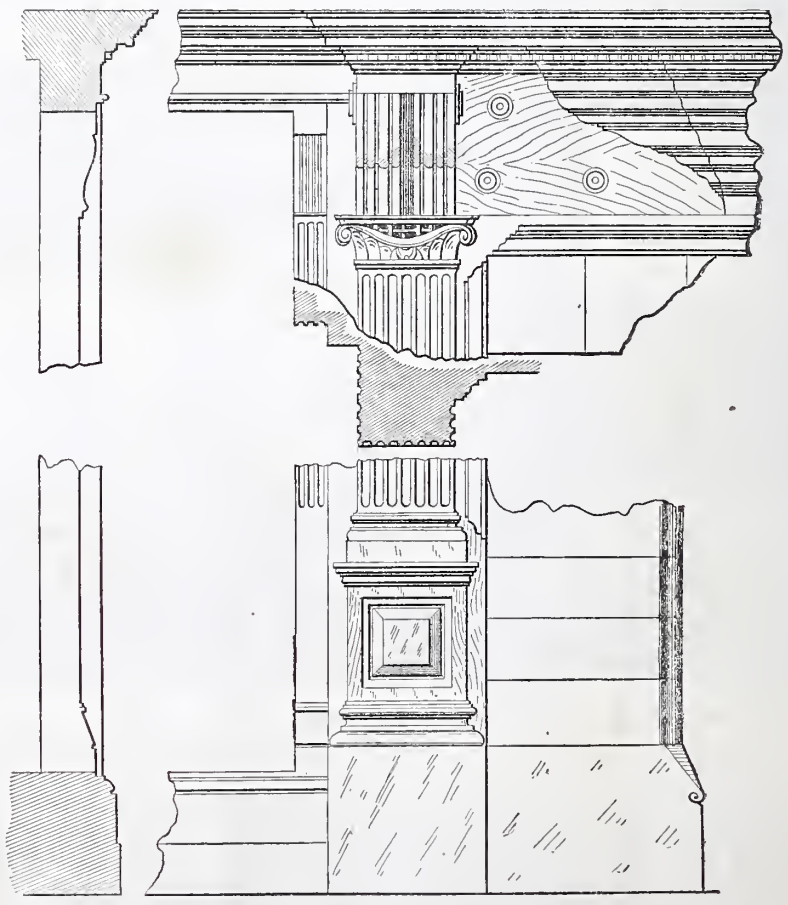



*A Study in Suburban Architecture.—Elevation of Side of Library, with Plan of Book-Case and Half Plan above Mantel Shelf. Scale, ⅜ Inch to the Foot.*



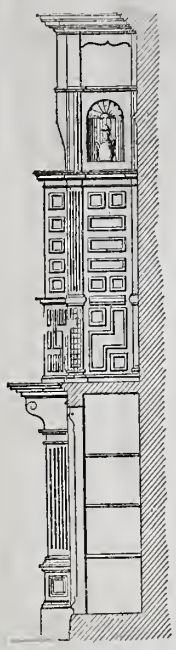
*Detail of Carved Recess at Side of Mantel. —Scale, 1½ Inches to the Foot.*

While in the Twelfth Competition, as in the one preceding it, there will be no specified limit of cost, competitors are reminded that what is desired is a cheap house rather than one that is extravagantly ornamented. An attic story is optional with the designer, although any attempt at framing the roof in such a manner as to provide additional room in a way that will add to the expense of building will be considered violating the spirit of the specification. The house should be designed in all particulars in a way to adapt it to the wants of people in very moderate circumstances. While it is desired that in its general features it shall conform to accepted standards of architectural design, no useless expenditure of money should be caused by ornamental features. This contest, as the previous one, will be one of design, appropriateness for the place and suitableness for execution by builders of average intelligence and experience. We cordially invite architects and designers in all parts of the country to take part in this contest. In closing, we would remark that variations in the front porch and one-story roof in the rear, should it be to the interest



*Elevation of Pilaster and Bracket Under Mantel Shelf.—Scale 1½ Inches to the Foot.*

of the designer to depart from the lines laid down in the plan, will be allowed. It is fair to consider roofs as part of the exterior

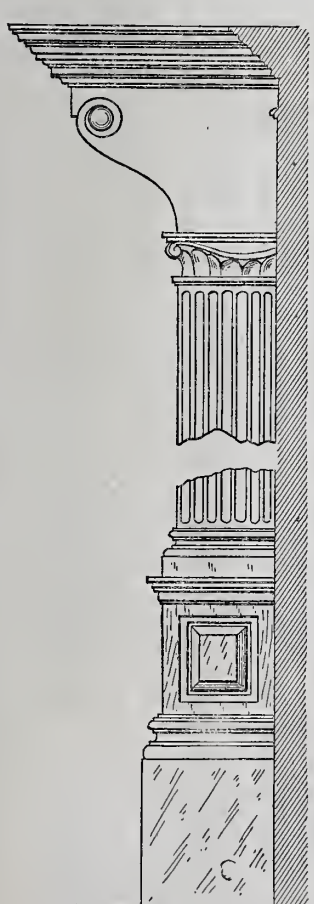


*A Study in Suburban Architecture.—Section Through Book-Case, with Side Elevation of Chimney Projection.*

design. The interest taken in these contests warrants us in anticipating a large number of competitors.

## Ebonizing.

How to make woods, such as cherry, mahogany, &c., look like ebony, is often desirable, and a correspondent gives the following directions: "To imitate black ebony, first wet the wood with a solution of



*Side Elevation of Mantel Pilaster.*

logwood and copperas boiled together and laid on hot. For this purpose two ounces of logwood chips and 1½ ounces of copperas to a quart of water will be required. When the work has become dry, wet the surface again with a mixture of vinegar and steel filings. This mixture may be made by dissolving two ounces of steel filings in one-half pint of vinegar. When the work has become dry again, sandpaper down until quite smooth. Then oil and fill in with powdered drop-black mixed in the filler. Work to be ebonized should be smooth and free from holes, &c. The work may receive a coat of quick-drying varnish; then rubbed with finely pulverized pumicestone and linseed oil until smooth."

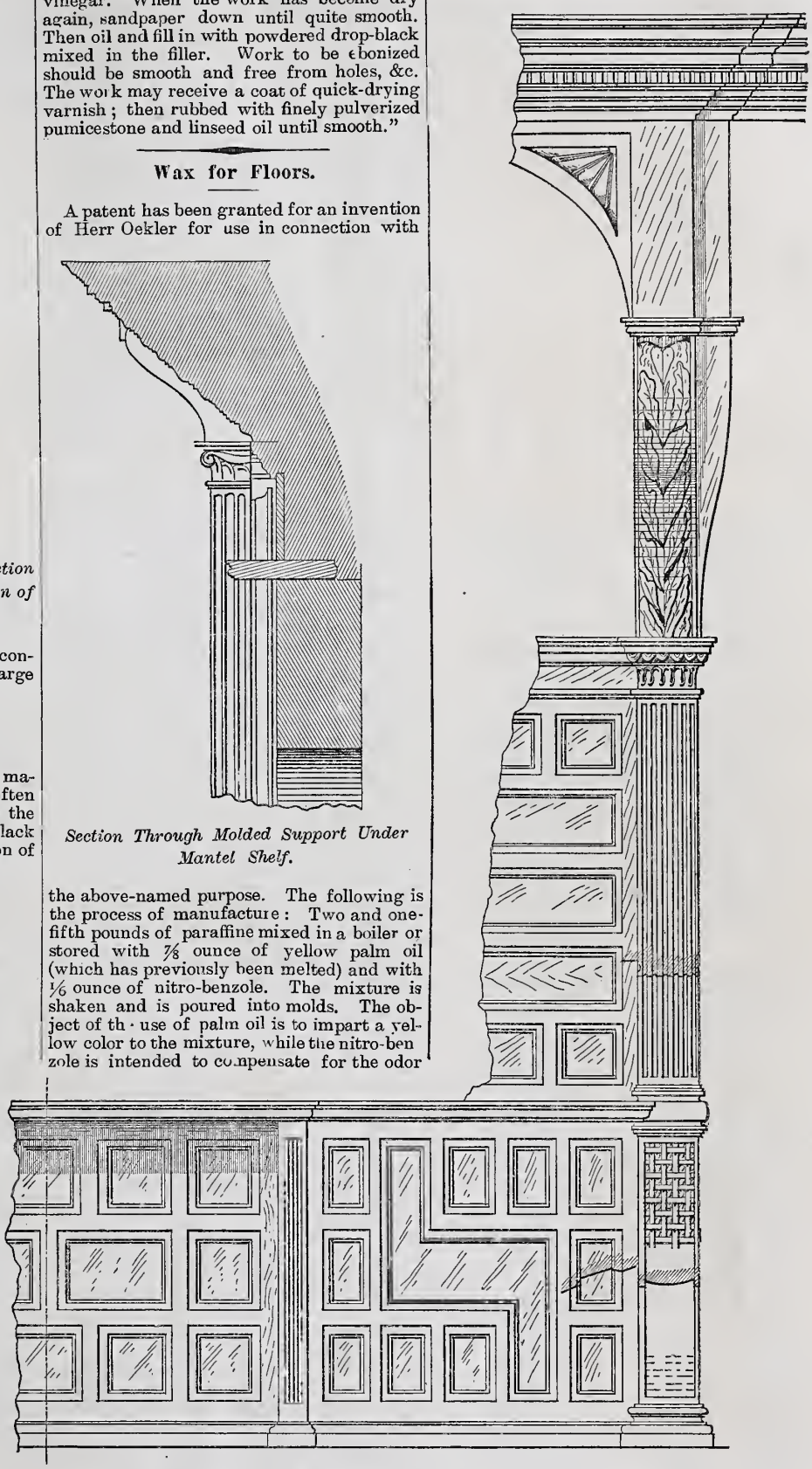
## Wax for Floors.

A patent has been granted for an invention of Herr Oekler for use in connection with



*Section Through Molded Support Under Mantel Shelf.*

the above-named purpose. The following is the process of manufacture: Two and one-fifth pounds of paraffine mixed in a boiler or stored with ⅞ ounce of yellow palm oil (which has previously been melted) and with ⅛ ounce of nitro-benzole. The mixture is shaken and is poured into molds. The object of the use of palm oil is to impart a yellow color to the mixture, while the nitro-benzole is intended to compensate for the odor of the paraffine. This wax is applied by being remelted, and laid on the floor by means of a brush or pencil. The quantity to be used is about ½ to ⅞ ounce per square yard of surface.



*Detail of Paneling Above Mantel Shelf.—Scale, 1½ Inches to the Foot.*

## French Polish for Wood.

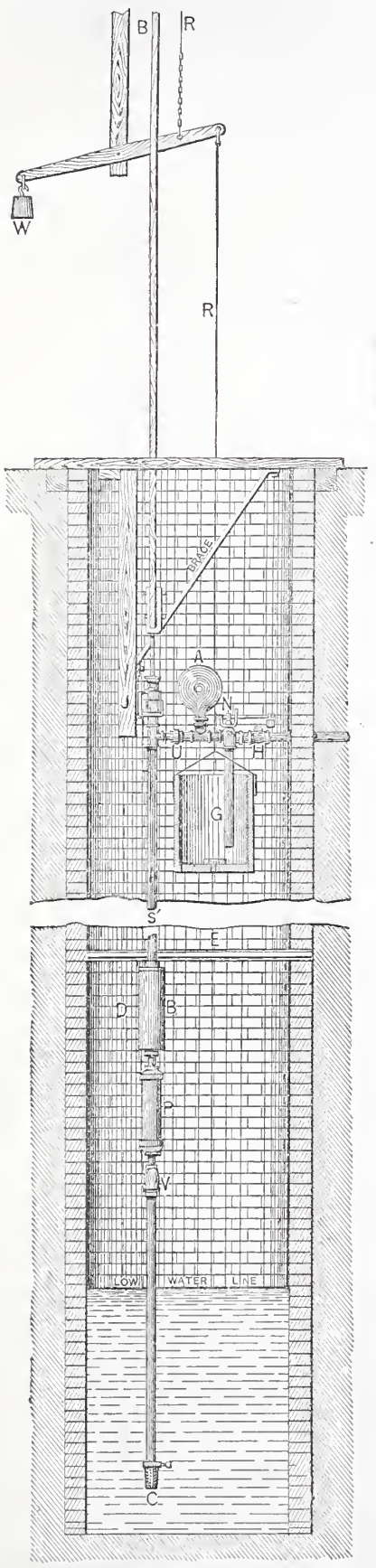
French polish is made by dissolving shellac in alcohol, methylated spirits, or even naphtha. This is facilitated by placing the jar or bottle in a warm place, on a stove or by the fire. Other gums are often added, but are not generally necessary. In short, no two polishers use precisely similar ingredients, but shellac is the base of all of them. The following recipes have been collected from various sources more or less reliable: 1. Shellac, 4 oz.; alcohol, 1 pint. 2. Shellac, 4 oz.; sandarac, ½ oz.; alcohol, 1 pint. 3. Finishing polish: Alcohol (95 per cent.), ½ pint; shellac, 2 dr.; gum benzoine, 2 dr. Put into a bottle loosely and stand it near a fire, shaking it occasionally. When cold add two teaspoonfuls of poppy oil, and shake well together. These, it must be remembered, are polishes to be applied by means of rubbers, and not by a brush. Those used in the latter way are varnishes, such as are applied to cheap wares and also to parts of furniture and such articles as are carved, and cannot, in consequence, be finished by rubbing.

## Water Supply for Country Dwellings.

BY A COUNTRY PLUMBER.

III.

The first of the accompanying engravings shows still another attachment to pump, for automatic stopping of mill, and will be described in connection with underground storage cisterns, Fig. 3. Situations and circumstances must determine which of these, if any, will be most practical in each instance. All are practical under favoring circumstances. Others may be found in catalogues of windmill manufacturers, and ingenious mechanics may make modifications to suit the requirements of different situations. For instance, the safety-valve attachment now shown can be just as readily applied to any of the pumps previously illustrated as to this one, and the regulator shown in a previous illustration (see *Carpentry and Building* for July, page 136) as readily applied to this pump. But when the tank or cistern is placed at a distance from the mill, overflow water cannot be used to stop the mill without laying a pipe expressly to convey it back to the mill. Modifications and changes will be suggested to the intelligent, thinking mechanic. The writer has aimed to illustrate and describe adaptations of pumps and attachments not usually described by the makers of windmills, and to give practical, comprehensive plans for erecting pumps, &c., that have proved to be safe and free from constant annoyance. When performing work of this kind for people not familiar with mechanical employment or without tools to remedy any defects, great care must be exercised and all complications possible avoided. Multiplying attachments necessarily increases the chances for derangement. The job should not be left until the tank or cistern is full if automatic stopping attachments are used, so that everything may be properly adjusted. If it is not practicable to remain until this is done, detach the float from the lever of the valve in tank, and return when it is full, selecting, if possible, a rainy day to make the adjustments. In a word, select the fittest, and look closely to details.




*Water Supply for Country Dwellings.—Fig. 1.—Deep Well Pump, with Safety Valve Attachment.*

Fig. 1 shows a deep-well pump and safety-valve attachment for stopping the mill, which is intended to be considered in connection with underground storage cisterns. In the cut J is a bracket stuffing-box, firmly bolted to a plank well secured and braced (as shown) to the platform or deck of well. B is the connection to windmill, A the air chamber on conveying-pipe, and H the check-valve on the same. Above the check-valve, and not shown in the cut, a stop-cock or straightway-valve should be placed in case the valve should need repairs. U is union connecting pump and convey-pipe, which should never be omitted, as the pump could not be disconnected from the convey-pipe in the event of needed repairs. P is a brass pump cylinder placed within easy drafting distance of water and connected to the stuffing-box by pipe S, with plunger-rod working inside. V is a rubber-ball check-valve on the suction pipe, sometimes used in deep wells where there is likely to be trouble from sand. C is a strainer on the bottom of the suction pipe, which should be covered with brass cloth if the well has sand at the bottom. D is an air-chamber on the pump to ease the stroke of pumping if the well is very deep. If several sections of pipe are used to connect the stuffing-box and pump cylinder, the plunger-rod should be in corresponding sections and coupled together with brass couplings, to prevent rusting fast. Fit these so that the rod, when a corresponding section of pipe is screwed on to the cylinder or section below, will stand a few inches above the end of the pipe, the plunger resting on the bottom of the cylinder; otherwise the next section of the rod cannot be attached. Thread couplings and rod ends to fit snug, and so that the ends of the two rods will meet and jam. This will lock them and prevent jarring loose. When the pump is in proper position and plumbed, stay the pipe to the wall of the well by a brace across to prevent vibration, as shown at E.

The attachment for stopping the mill is a safety-valve, shown at N, Fig. 1, on the conveying pipe near the air chamber, in connection with a valve and float, shown in the cut of the cistern, and operates as follows: When the cistern, Fig. 3, is full the float F closes the valve V by pulling on lever L. Water is then forced through the safety-valve N attached to the pump into box G, Fig. 1, which should hold about five gallons. Its weight, pulling down on lever L and shut-off rod R, stops the mill. The weight W on the lever should be heavy enough to balance box G when empty, and the weight on the safety-valve sufficient to keep it closed while the cistern is being filled. Box G and its arrangement was described in a previous chapter, where it was filled by the overflow from the tank. It should be arranged in this instance in identically the same manner. This method of stopping the mill when the tank or cistern is full is preferable to a regulating cylinder or hydraulic jack when water is forced to an elevation more than 30 feet above the ground at the mill. The waste water from the box G may in some instances be objectionable, but not if the pump is in a well. If the pump is placed in a pit the water may be conducted to a drain or sewer.

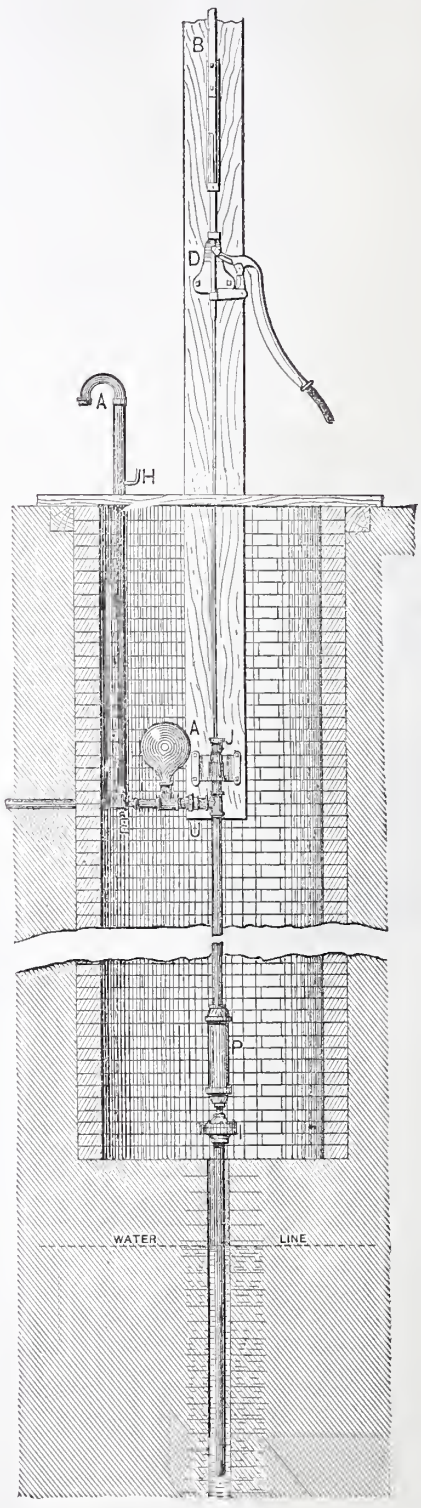
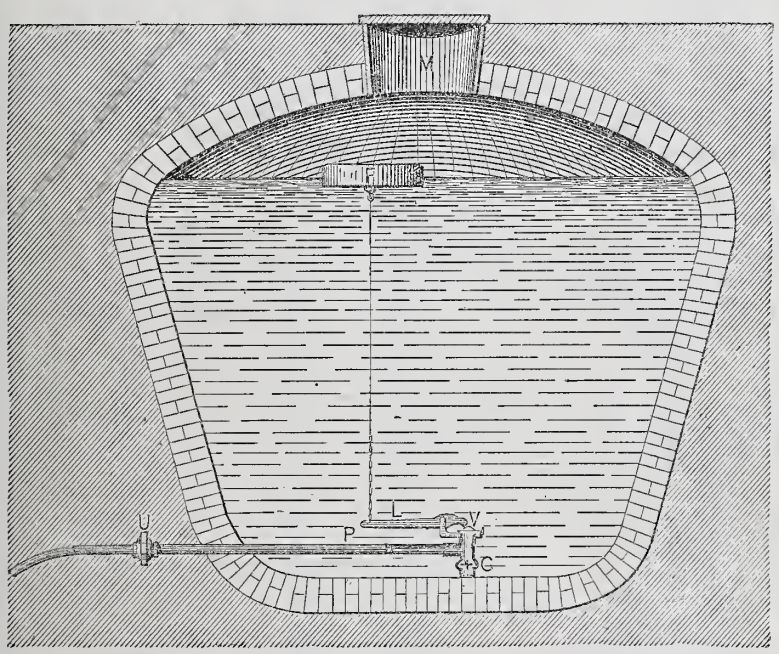



*Fig. 2.—A Hand Pump Used in Connection with a Windmill.*

If it is desired to connect the conveying and distributing pipes, arrange the valves on the pipe in the cistern as shown in the cut, C being a vertical check-valve, connected with float-valve V and pipe P by a gas-pipe, T, and close nipples, and having a strainer attached. These valves should be brass, or, if iron, with brass seats and weights. Water from the cistern could not enter pipe P through valve V, but by means of this additional valve water may pass from the cistern

through the strainer and valve C, and be drawn through pipe P at any time. If the house-pipes are connected with the conveying pipe and they are iron, it would be well to put in at some convenient point a short piece of lead pipe between the house-pipes and supply pipe to prevent the noise of the pump and valves being heard within the house. Whenever the air chambers become filled with water, considerable pounding may be heard wherever the pipes reach, if they are iron. If the house-pipes be lead this does not occur.

Fig. 2 shows how this pump may have a hand-pumping attachment applied. J is a front view of the bracket stuffing-box bolted to a plank secured to the platform of the well, and reaching up to the framework of the mill tower, to which is bolted the bracket brake D. The windmill connection is clearly shown in cut, and needs no description. By means of the three-way cock E, operated by crank H, water may be drawn at spout K. Drill a small hole in the pipe leading to spout K, to draw off water and prevent freezing. At I is shown a wire sieve strainer, made of two castings bolted together with a piece of fine brass cloth




*Water Supply for Country Dwellings.—Fig. 3.—Underground Storage Cistern, with Automatic Attachment.*

between them. The castings are enlarged where bolted to give a good surface of cloth. This is an excellent arrangement to prevent sand and gravel getting into the pump and wearing out the packings or injuring the valves. The suction pipe is shown set in a drilled hole at the bottom of the well. If the pump is placed in a driven well, or well drilled or bored from the surface of the ground, an excavation of 5 to 7 feet deep, and large enough to wall up 3 to 4 feet diameter inside, should be made to receive the pump attachments. The platform or deck over this should be made close, and in the Northern States doubled, to protect pipes from frost. A manhole or hatchway should be provided in all cases to afford ready access to the pump.

## Patent Paints.

A correspondent of the *California Architect and Building News* writes a letter to that paper in regard to the patent paints in the market and their essentially bad qualities. Most of his remarks are so sound, and the points which he makes so well taken, that we cannot refrain from quoting them in full. He says:

"The modern system of compounding paint has adapted itself to the mercenary spirit of the age, and patent mixtures are almost exclusively of this class. The new invention of a mode of mixing a particular paint has its origin in the brain of some mediocre duffer in pigment, whose knowledge is so meager that when the compound is made (not being aware of its chemistry), he regards it as an original mixture, and forthwith has it patented. A wise man in ancient times said there was 'nothing new under the sun,' but in these days, if there is nothing new, there is a plethora of evolution that makes new developments. These cheapened crude paints are manufactured for the market, and are sent in trade all over the country, with flaming color lists, which attract the eye of the uninitiated, who buy them because the colored chromo list represents a better paint, and on these proofs only are these patented paints sold everywhere.

"The following is a sample of late patents for roofing paint, issued August 29, 1882:

"'*Claim.*—The herein described composition of matter to be used for painting roofs of houses and iron fences, consisting of benzine, sulphate of iron, oxide of iron, asphaltum, varnish, oxide of lead, japan, burnt umber, hard rubber, bisulphate of carbon and coal tar, in the proportion specified.' Another, issued May 16, 1882: '*Claim.*—1. The herein described paint for roofs, consisting of a mixture of coal car, turpentine, sulphuric acid and a suitable pigment material, substantially as herein described. 2. A composition for painting roofs, consisting of a mixture of coal tar, turpentine, sulphuric acid and asphaltum, when mixed in the proportions as herein described.' In the claim noted first, there is nothing really binding except the rubber and coal tar, which, when well-diluted by the benzine, would render it a fleeting mixture. The pigments enumerated form a singular body-guard quite too-too to need the superfluous support of asphalt varnish or japan. It is very apparent that the vehicle to carry this heavy load of ingredients is too weak to bear the burden imposed, and when sublimated under a solar heat, the motor generated will caused the vehicle to travel like chaff, and even to fly before the wind from all metallic roofs, and be of little use on any other surface.

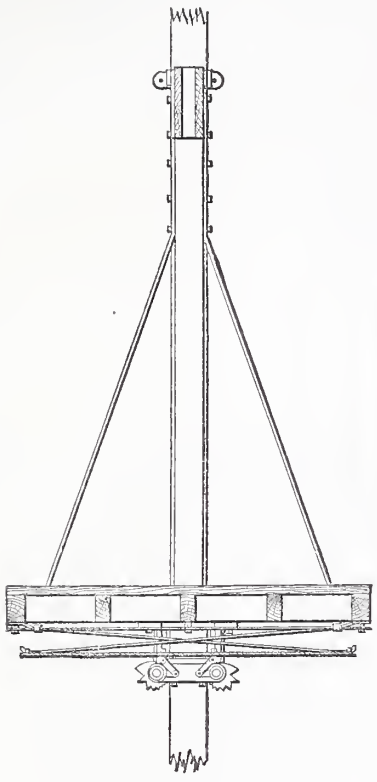
"The latter claim quoted is even more vile. Its binder consists of coal tar, of no permanent value, and when attenuated with spirit of turpentine, will soon vanish under ordinary temperature. Another patentee claims to originate a coating mixture for all exterior surfaces, as the following will show: 'I claim the improved process of covering exposed surfaces or walls, consisting in first coating said surfaces or walls with the described mixture of pulverized gypsum and glue, and then painting them substantially as described.' All dope mixtures of this and similar nature have been in use for scores of years (without a patent), and many of them far superior to this one. And what is true of one is the virtue of all—they all need subsequent substantial painting. Their only use is to cheapen the work, and it generally does this effectually, for the painting that follows such primings is not homogeneous, and therefore they will not combine and form a solid permanent surface coating. There are no glue preparations for outside work that will stand like the oil—the pure linseed oil—priming, which dries firm and is the foundation for all kind of work that needs to be honestly done. The cheap patent mixtures are generally for the use of contractors for doing work under price, and the work is patent, for it speaks for itself—it needs no advertising. The fictitious paste paints in vogue are made for the general public and country dealers. This class of goods are wholesaled at figures that offer great inducement for buyers to stock their stores with them, being fully assured of much larger returns for their investment. Merchants who deal in these patent paints wink at the gullibility of the public buyer, and smile blandly over their profitable sales. Painters who have served an apprenticeship to their trade do not need these bogus paints to do good, creditable work at painting. They need only pure lead and oil, which form the basis of all colors and shades needed in housework. The modern chemist has not improved on these, and, failing to do that, has often assisted and has made formulæ of soluble mixtures and silicate pastes as substitutes for reliable paints. There are wants it may, in its purer silicate form, serve to fill, but as a substitute for white lead it is a failure. It is claimed that the silicate combination with sulphate of baryta forms a fine white paint, yet the tendency to use water freely makes it unfit for wood, while it may answer for textile fabrics, cardboard, &c.

"The sulphate of baryta is now very generally employed in the manufacture of cheap white paints ground in oil, and passes under a multitude of brands as pure white lead. As a white paint, it is inferior in every way as to body or covering quality, yet, compounded with it, makes a very serviceable paint, and may be used as a priming for all classes of cheap work. The so-called permanent white or artifieial sulphate of baryta is one of the compounds of liquid glass, and, under the name of blancfix, it is used by card makers, paper stainers and paper-collar manufacturers to a very large extent. The advocates of these and other patent paints say, with truth, that lead paints are more deleterious to health than the new compounds. Yet, while we admit that, we do not concede any equality to liquid or soluble glass mixtures with the former. The artificial sulphate is obtained from native minerals, such as heavy spar, witherite or carbonate of baryta, and when manufactured produces a fine white pigment. This substitute, when mixed with dextrine, starch or other binding material in connection with the liquid silicates of soda, offers a paint of a fireproof nature, free from the odors of linseed oil, lead or turpentine. A paint of this kind should be employed in painting the casings of elevator shafts and the woodwork of sleeping-cars; they would burn less rapidly if tinted with such a coat of fireproof material, and thus give more time for the rescue of human life."

Our readers must not, in this connection, suppose that all the patented mixtures or all mixtures which do not contain lead and oil are to be discarded for indoor use. A whitewash made with salt, and well sized, answers a very desirable purpose for a great deal of indoor work, especially in factories and places where cost is a material consideration. Thorough whitewashing of beams does very much toward making them fireproof—certainly renders their combustion more difficult, and so delays the spread of the fire. Alabastine, too, can be applied in many places commonly painted, and though not to be recommended as a general substitute for paint on indoor woodwork, yet has a very wide range of itself, and we believe, like a whitewash, when applied to wood tends toward rendering it fireproof.

## Safety Elevator Attachment.

The three illustrations which accompany this article represent a new form of safety attachment for an elevator which we believe actually does what its name indicates—provides a safety appliance which will guard against all accidents arising from the too sudden dropping of the coach, either by the running away of the machinery, breaking of the rope, or other similar accidents. It is



*Safety Elevator Attachment.—Fig. 1.—Side View and Section.*

made by Messrs. Clem & Morse, 413 Cherry street, Philadelphia, Pa. Fig. 1 is a side view and section, Fig. 2 a plan, and Fig. 3 a side view taken at right angles to Fig. 1. The principle on which the elevator operates is, we think, somewhat novel. The mechanism by which the platform is stopped in case the rope breaks or an excessive speed is reached consists of a pair of toothed cams, shown in Fig. 1, which are partly rotated so as to engage in the wooden sides of the guides and hold the platform at any point.

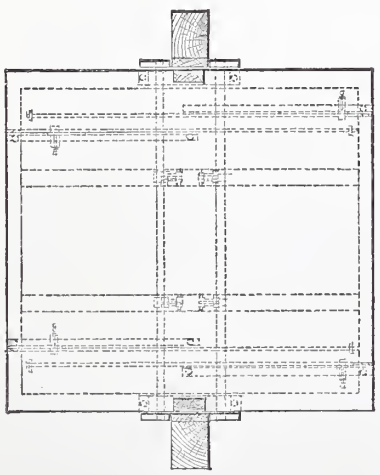


*Fig. 2.—Plan.*

These are operated by bell cranks, attached, as shown in Fig. 3, to what may be called a table. This table is nearly the whole size of the elevator platform, and is made of ½-inch pine. It is supported on straight steel springs, shown crossing each other in Fig. 1, and attached to the outer edges. These springs are so adjusted that the table is practically without weight, and may be said to float in the air beneath the platform. If this table be raised even a short distance, the cogged cams are, by means of the bell cranks, turned so that their teeth catch the guide-posts, and the downward motion of the platform itself forces them in until the motion is entirely arrested. In case the rope breaks or the platform starts downward at a speed above that for which the apparatus is set, the pressure of the air on the floating table forces it upward and the teeth engage, and the main platform is stopped within a space so small that it is scarcely worth measuring. We have seen the rope cast off repeatedly, which was equivalent to a break, and in each case the fall of the platform was altogether too small to be measureable. We have heard of experiments with the apparatus where care was taken to measure the actual distance of the fall, and it was said that the car was arrested within ¼ inch of the point where the rope was cut. Whether the car be run loaded or empty, the effect is the same, the teeth taking hold exactly in proportion to the weight on the platform. By adjusting the straight springs which hold the floating table in position, provision may be made for running the elevator at any desired speed or for tripping the gripping mechanism when any given speed has been exceeded. In Messrs. Clem & Morse's own establishment the vertical guides are lined on each side with heavy strips of ash. In the experiments which we have noticed the teeth usually scored the ash for an inconsiderable depth. Of course, with a heavy weight they would be pressed in perhaps ⅛ inch or more.

The cams on both sides of the car, as will be seen in the plan view, are on one shaft, and near the center are the rock-shaft attachments for turning them. It would seem, from all that we have been able to learn of this apparatus, that it actually provides a device by which safety may be assured, and if attached to a car would prevent injury not only by actual breakage of a rope, but would prevent those accidents which sometimes take place where the winding machinery gives way, allowing the car to fall, and yet the rope on the drum keeps up a sufficient tension to prevent the gripping devices from acting. It would obviate those cases where the governor rope breaks or fails to act. Messrs. Clem & Morse apply it not only to ordinary freight, but also to passenger, elevators of all descriptions. It does not require any considerable alteration of either elevator or guides, the only requirement being that there should be sufficient clearance to enable the toothed cams to get a bearing on the edges of the wooden guides.

## Building Materials.

THE CHANGES WHICH TIME AND FASHION BRING ABOUT.

Every one at all interested in the progress of improvement in Philadelphia, says the *North American*, must have observed a remarkable increase within the past 10 years of the use of white marble on the fronts of dwelling-houses. This fashion, like most others in Philadelphia social life, came to us from New York City, where it had been the result of a natural reaction from the universal usage which, in the course of half a century, had given New York the aspect of a city of brown-stone. Some 30 years ago this brown-stone furore seized upon Philadelphia, and after a time achieved marvelous results. But the same reason which had made brown-stone after a time unpopular, on account of its gloomy aspect, had a similar effect upon Philadelphia, where, after raging for 15 years or more, there commenced the movement of restoration of white marble to popular favor, which proved so successful that in the course of 10 years it really began to look as though the whole city might be rebuilt of marble, in place of brick. This, however, was soon varied by the changes of taste and fashion which gave birth to rows of dwellings with fronts of green serpentine, or of alternate groups of houses of white marble and brown-stone. In the commercial district some very fine buildings were erected with massive fronts of Quincy granite, Allegheny free-stone, iron and fancy brick. In the course of time the last-named of these styles naturally enough extended to new rows of dwellings in the suburbs, except, however, that none of these rows have as yet been constructed with entire fronts of handsome white enamel brick, like the building of the Westmoreland Coal Co. at the corner of Third street and Willing's alley. The fancy brick fronts have, however, become quite fashionable in all the better parts of the town, and this fashion also comes to us from New York, which, after having for half a century ridiculed the red-brick houses of Philadelphia, took a fancy to admire the superior quality and finish of our first-class Philadelphia brick, having probably ascertained from England that the finest red brick is the very best building material in the world. Iron fronts have, for some strange reason, hitherto been confined to stores, warehouses and business edifices in the commercial district that are not used for dwelling houses, although there is positively no building material at all so peculiarly adapted for ornamentation as iron.

## Do Something.

That genial humorist familiarly known as *Hawkeye* Burdette is something of a philosopher, and frequently delivers himself of sage advice to the young, as witness the following from a recent lecture:

My boy, if you want to be something in the world, you must begin something. You

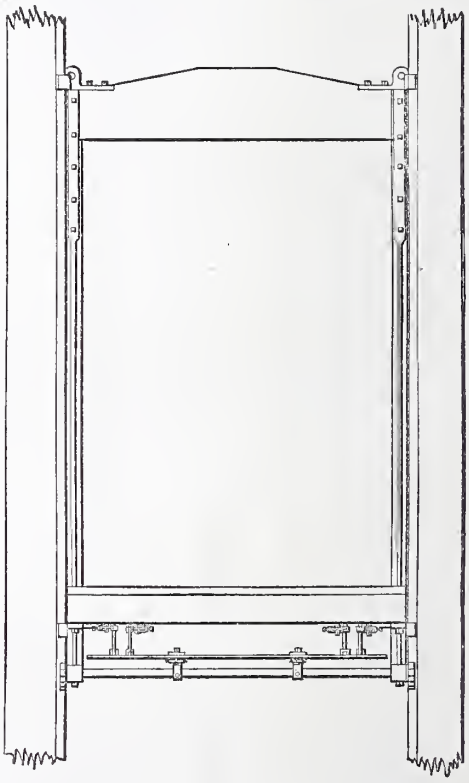


*Fig. 3.—Side View Between Guides.*

must have and assert an individuality. If you have a family tree that reaches to the stars, draw your pen through every name on the record until you come to your own, and stand squarely on that. A grand old ancestry is a splendid thing to have, and a grandfather is something to be proud of. But your own ancestors won't make you, my boy; because they are dead, and the world of to-day wants live men. Nobody gropes in the graveyard except the medical student. Queen Victoria traces her blood back to William the Conqueror. Well, she can't help it; she isn't to blame for it, nor does she deserve any particular credit for it. Such a woman as Victoria, my boy, reflects honor upon her ancestors—her pure womanhood would honor them, though she never were a monarch; but I can't see that her ancestors did her any great honor. Why, you suppose you can only trace your ancestry back to your father; why, your father is a better man, a better Christian, he wears

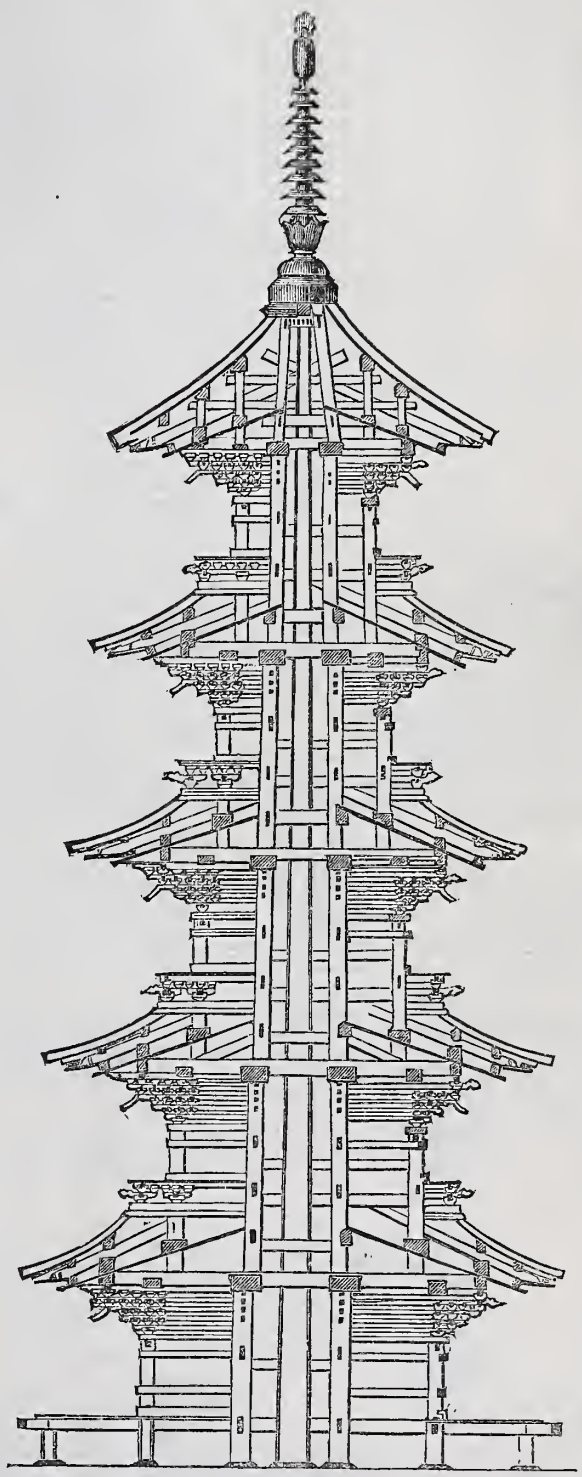
better clothes, he lives in a better house, he has more luxuries and conveniences in life, than was or did or had William the Conqueror, and so you are that much ahead of the queen. Look me in the eye, Telemachus. Would you feel proud if you could prove that you were a lineal descendant of the four Georges? Certainly you would not. If you should have said yes, I should have advised you to stuff yourself and sell yourself for a cigar-store sign. If you assert yourself, my boy, that is all the world asks of you. If the world has work for you to do, if it wants and needs you, it isn't going to bark up your family tree. Who asked about Lincoln's ancestors? Who stopped in 1863 to ascertain if Grant's family came over in the Mayflower? What "old family" did the American people elect President in 1880? What great-grandfather invented the telephone? God bless your grandfather, my boy. Love his memory, honor his name, revere his teachings, but don't try to wear his shoes to-day. You can't run and climb in them. I tell you, your neighbor will question more closely the pedigree of the blooded horse or the milk cow you want to sell him than he will your own.

When I hear a man talking too much about his ancestors, I begin to think he needs them very much. And I always feel sorry for a man who died before he was born, and lives only in the deeds and words of his great-grandfather. Don't die out two or three generations before you begin, my boy. Live your own life, if it kills you. I have known some men who were very proud of their ancestors, whose ancestors would have been ashamed of them. Pride of ancestry! It is dust under your feet compared with pride of posterity. You never in all your life felt that pride in your great-grandsire, who fought at Bunker Hill and shivered at Valley Forge, that you will feel in your first boy, even when he is three weeks old and has nothing to show for himself but flannel and wrinkles. When a man, on his way to a drug store for 10 cents' worth of paregoric, meets the younger man going to the furniture store to buy a $35 cab for his first, he cannot repress the smile of pleasant pity that curves his older lips. But, bless you, it doesn't hurt the young man a particle. He can stop right there in the street and give his older neighbor points on the treatment and culture of children. Don't waste your pride on your ancestors, my boy. Save it for your posterity. They will be in better circumstances and live in better times. While your ancestors came over in the Mayflower—a leaky old tub of a sailing vessel, that landed the Pilgrims and then went straight away for a cargo of slaves to land in the West Indies—your children will go across in a Cunarder, first cabin, faring sumptuously, and only ten days out. It is enough for you, my boy, to know that your ancestors were good, brave, honest, hard-working Christian men and women. For the rest of it, do you live your own life, and live it so that you will honor them aud add new luster to their good names; but don't, my boy, I beg of you, don't try to "boost" yourself up in the world on what they did long before you were born. Do something yourself.

## The Construction of Japanese Pagodas.

Every mechanic who is also a general reader realizes that the architecture of Japan is something very different from that seen in this country, or, for that matter, in any other part of the world. It might be difficult, however, for him to point out its characteristics, or with pencil indicate its peculiarities, or with tools and timber construct a model of any feature of this architecture. In the illustrated papers, general views of dwellings, temples and other buildings have been given, so that the mind possesses a general idea of Japanese architecture, but very little is known about it definitely. We take pleasure at this time in laying before our readers an engraving that shows the manner of framing a Japanese pagoda. The leading features are so clearly indicated that any one who examines the engraving with care will comprehend the construction employed.

Some time since Dr. Dresser, an eminent English authority on art and architectural topics, contributed to the *Building News* a theory with reference to the construction of wooden towers by the Japanese. A leading feature of these towers, as shown by our engraving, is a center post, running from the ground to the top. The theory that Dr. Dresser advocated was that the wooden post running through these towers does not touch anything at the bottom, but is allowed and intended to swing as a large pendulum inside the structure. The object is that by its pendulum-like action it shall steady the building during earthquake vibrations. Mr. Josiah Cander, architect to the Japanese Government and located at Tokio, Japan, noticed this opinion of Dr. Dresser, and from his personal knowledge of matters in Japan, knowing it to be incorrect, sent to the *Building News* the drawing from which the accompanying engraving was made. As his letter accompanying the drawing is of general interest in this connection, we append the larger portion of it, as follows:



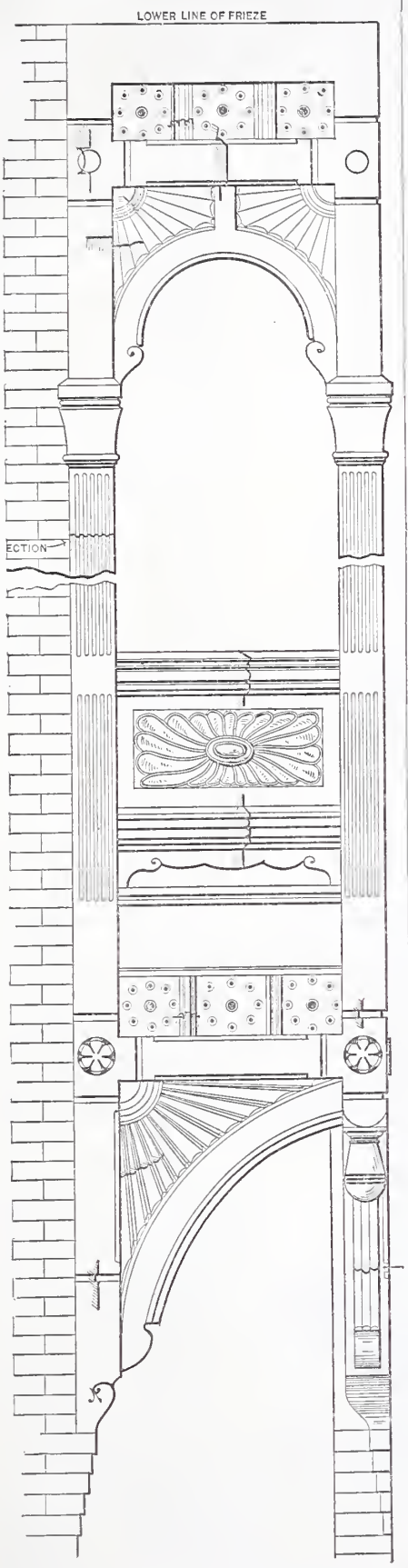
*A Japanese Pagoda.*

In placing such a post through the center of the structure, the Japanese builder is sufficiently practical to know that if he were to plant its end upon the ground in the first instance, one of two things would happen when the tower with which its top is connected shrinks, settles and takes its final bearings—either the central column would become bent and distorted, or it would cause, by its rigidity, a serious disturbance in the joints and framing of the upper portions of the structure which are tenoned into its head. Accordingly, having framed together the several stages of the structure as far as its terminal roof, he connects the central post like a large "king" with the top, taking care to make its length shorter than the combined hight of the tower stages by just so much as he calculates or guesses the final settlement will be. He then wedges it up at the bottom with yielding wedges, which allow of the whole settling together, and which can be finally removed. The skill and reputation of a tower builder depend upon this result being effected to a nicety, and though there exist pagodas in which the post does not quite touch at the bottom, the Japanese architects assert that these are owing to miscalculation. They certainly have no "pendulum-like action," as the framework round them (see drawing) prevents them moving more than a few inches at the most. The supposed weight in the center of the column is nothing more or less than the Japanese method of making a strong splice or scarf-joint. The intention of this central post is to give the tower rigidity and stiffen it against the force of the wind. In case of earthquakes, our seismologists rather hold that the addition of a continuous member, having such a length of oscillation, would certainly increase the swing of the tower during a very severe earthquake, the vibrations being otherwise limited to the shorter periods of the separate parts of the framing.

The passing visitor comes here and tells the Japanese that their houses are built in such a way, and their towers built in such another way, "because of earthquakes"—to their own hardly disguised astonishment. But after more than three years' endeavor to collect information from native architects of all kinds, I have never been able to get them to claim the prevalence of earthquakes as a reason for any one of their theories or modes of construction. On the other hand, old observing builders who remember the destructive earthquake of 20 years back tell me that those buildings which were erected with their wooden framing resting upon isolated stone supports were those which suffered most, while the storehouses and outhouses having stone footings or posts sunk into the ground were comparatively uninjured. There is an instance of a large pagoda which was shifted 6 feet bodily upon the soil, and tipped off its low stone supports, by an earthquake. For this statement I have the authority of an old architect now at work on the Emperor's palace.

## The Brickwork of Chimneys.

In a communication to the *Deutsche Bauzeitung*, Herr Eckhartz has expressed his opinion that the cause of crevices being formed in the brickwork of chimneys is the




*First Prize Design, Ninth Competition.—Fig. 30.—Overhanging Balcony on Dining-Room Bay.—Scale, ½ Inch to the Foot.*

difference of temperature between the inner and outer surfaces. While in many cases in an ordinary factory chimney the flue has internally a temperature of nearly 600° F., the external temperature is only about 60° on an average, the difference of expansion which is thus occasioned producing the cracks referred to. He dwells upon the use of iron hooping, and remarks that its object and result are not, strictly speaking, the prevention of expansion, but rather the attaining in the outer brickwork of a uniform distribution of the tension, and the prevention of its concentration at certain points. The question whether wrought-iron rings in the inside of a flue are liable by their own expansion to produce cracks has been for some time under discussion in German technical circles. A short time ago, Doctor Tomei recorded, in the journal referred to, his opinion that the binding of chimneys by means of iron inside the masonry was a measure only to be recommended in exceptional cases, and with the observance of special care in its execution. He considered that the external binding of brickwork was, however, a question which was to be regarded in a different light. Herr Eckhartz, though not founding his remarks exactly on those of Dr. Tomei, further illustrates them by saying that if ironwork placed internally fails to prevent cracks, and even produces them, its employment in that way is not only superfluous, but injurious. If rightly constructed, he considers that for resisting the effects of the wind no hooping is required by a chimney. In further elucidation of the theory that internal hooping is unsuitable, he remarks that the ironwork should, as a matter of course, not be exposed to a high temperature; and he maintains that all rings inside masonry must, under these circumstances, be subjected to the influence of heat. If they have not sufficient space for their expansion they exercise a pressure upon the external brickwork, and thereby produce cracks. From the facts thus quoted Herr Eckhartz deduces the recommendation that in order to provide against the results of the difference in temperature to which allusion has been made, double walls should be constructed. He refers to the chimneys for circular furnaces which have been designed on this principle by Herr Hoffmann. He uses double mantels, each only half a brick in thickness, which are united by vertical ribs of the same thickness. Inside the chimney is an isolated mantel, half a brick thick, which is built up to the hight of 11 to 22 yards, according to temperature ruling in the chimney. This mantel is exposed to the most intense action of the heat, and from the nature of its construction is not injuriously affected by any extension which takes place. Herr Eckhartz claims for this method of construction the subsidiary advantage of economy in fuel, and adds that his personal experience confirms him in the opinion that it is the only system by the use of which iron hooping can be completely dispensed with.

## Details of First Prize Design in the Ninth Competition.

On this and the following pages we give the remainder of the details of Mr. Church's design, the perspective, elevations and plans of which were published in our issue for June. The details here given, together with those presented in the June and July numbers, complete this very interesting study.

## Door-Knobs.

There is hardly any object that everybody handles so frequently, finds so necessary, and yets thinks so little about, says a daily paper, as the door-knob. The time when they, as it were, glue themselves on to attention and compel earnest consideration is when they pull off their spindle—or, at least, come off so easily that it seems as if they did it themselves—and in hurried attempts to jam them on again the spindle is accidentally punched through the lock, out of reach, and a cousiderate, sympathetic wife looking on says, "How stupid!" or, still more exasperating, "What are you going to do now?" But so long as the door-knob sticks in place it is inoffensive, never dodges out of the way as keyholes sometimes will, never barks one's shins like a rocking-chair, never howls when touched, as bedsteads are wont to—is, in brief, unobtrusive, handy, and, like most simple useful things,

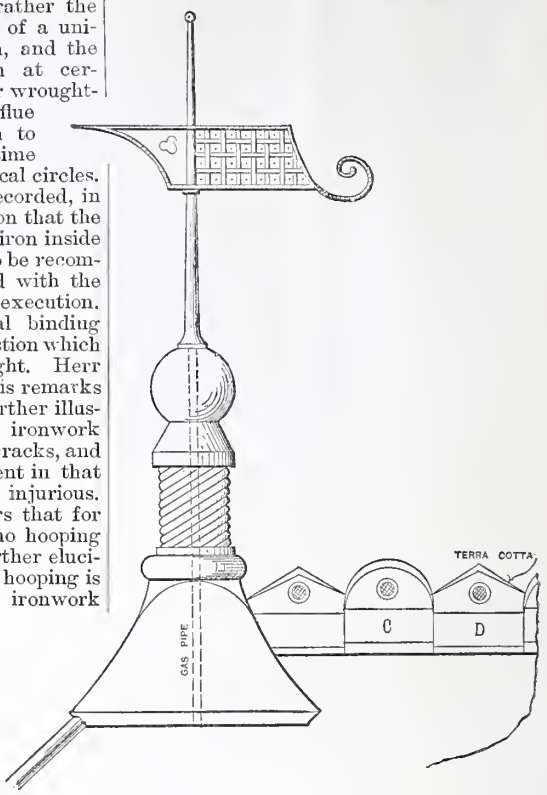



*Fig. 31.—Finial and Cresting on Main Roof.—Scale, ½ Inch to the Foot.*

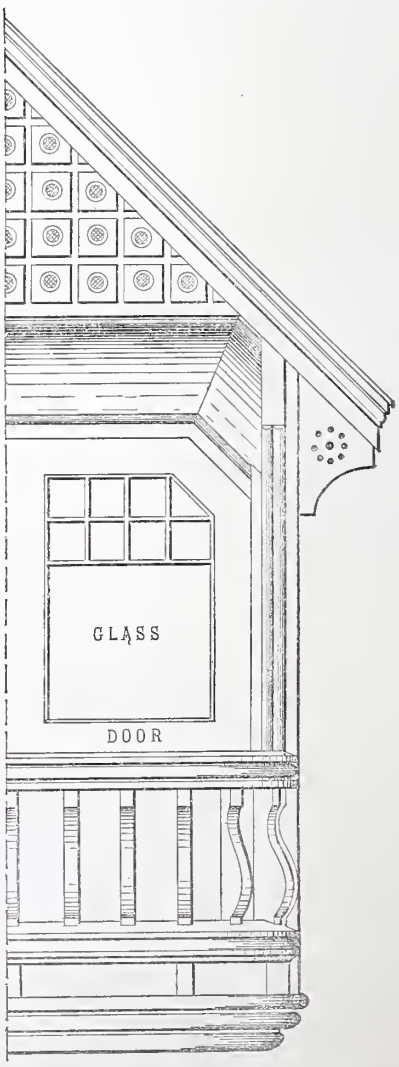



*Fig. 32.—Half Front Elevation of Outlook, Main Roof.—Scale, ½ Inch to the Foot.*

is likely to be little thought of. But there is a good deal to be said about door-knobs. A gentleman who has all his life kept up an

intimate business acquaintance with door-knobs said recently concerning them :

All the door-knobs in England formerly wore made of wood or cast iron—big, solid, heavy things, and for a time the American ones were the same. But that could not last in this country, where taste and inventive art are active in the combination of the useful and the beautiful for every use in life. We soon commenced to make our own door-knobs, upon the old English plan at first, but ere long with other materials, and with an eye to improvement in form and color, beginning a progressive course of improvement that already puts us in this specialty, as in many others, ahead of the world in the production of goods that are at once beautiful, durable and cheap enough to be popular. It was about 1842 or 1843 that the manufacture of door-knobs from clay was commenced in this country. Clays that would change their colors in baking were selected and mixed together, after being very finely ground, pressed into molds, baked to what is technically known as biscuit, then coated with a fusible compound called "glaze," and rebaked at sufficient heat to melt the glaze and give them a glassy surface. They had a dark, mottled appearance, were known as "mineral door-knobs," and sold for as high as $18 a dozen pairs. They still have a place in the market, but they are now worth only 80 cents a dozen pairs—the cheapest made. Door-knobs, by the way, are always sold in pairs, and when we speak of a dozen it will be understood that we mean a dozen pairs. Porcelain door-knobs—white ones—came next. They are made of porcelain clay, to which ground bone is added, baked and treated like those already spoken of, and are only a little more expensive.

Thirty years ago the "Agillo" knob came out. It was a very pretty thing, of bright, contrasting colors, compounded of clay, sand, feldspar, silex, red lead and some other metallic substances that we do not now remember. One may occasionally come across them yet in some exceptionally fine old buildings out West, but they are very scarce. Indeed, very few of them were ever made. There was too much uncertainty about them for successful manufacture. It was never possible to tell in advance how they would come out of the kiln. We know one gentleman who burned a very large kilnful of them, and when they came out there was one exceedingly handsome, while all the others, made in exactly the same way, were black, rough and valueless. Holding up the perfect one, he remarked, "That knob has cost $16 00," and straightway gave up the business. The next step in this line of manufactures was in the production of what were known as lava knobs. They were mainly composed of sawdust and glue—the same materials that the old-fashioned daguerreotye cases were made of—and were of a beautiful dark-brown color, often very charmingly molded. The hemacite knobs, made of sawdust and blood, "and a little Boston Back Bay mud thrown in," as they say in the trade, were very much like the lava kind. Both are pretty, durable under favorable conditions, and are worth $4 to $5 a dozen.

The greatest stride in the progress of door-knob manufacture was taken in 1873 or 1874, by a metallic compression casting company. The material employed is bronze, mainly composed of nine parts of copper and one of tin. The molds prepared for it are made with such extreme nicety and fidelity to their pattern that they reproduce lines as delicate as the veinings of a tiny leaflet, and the molten metal is forced into them by screw pressure while they are inclosed in the vacuum box. The articles made in this way are known as compression bronze goods, and a variety of claims to superiority over other bronze goods are made for them, the principal of which, so far as the public is concerned, is their beauty. Some of them are plated with nickel and gold, nickel and silver, or silver and gold in various combinations. The most expensive are those with combined decorations of enamel and gold, which mount up to $15 or $16 a pair. Japanese fancies, Etruscan novelties, *bas-relief* Cupids, animals' heads in *alto relievo*, æsthetic things with sunflowers and lilies on them, and non-æsthetic ones with much prettier flowers, monograms and seals, and thousands of other ornamentations on forms that are round, square, hexagonal, flat, convex, concave, oval, and the makers only know what all else, are very plenty.

A pretty novelty lately introduced is the highly polished, sometimes fire-gilt, smooth brass door-knob in the shape of an egg. Monograms and seals are put on to order,

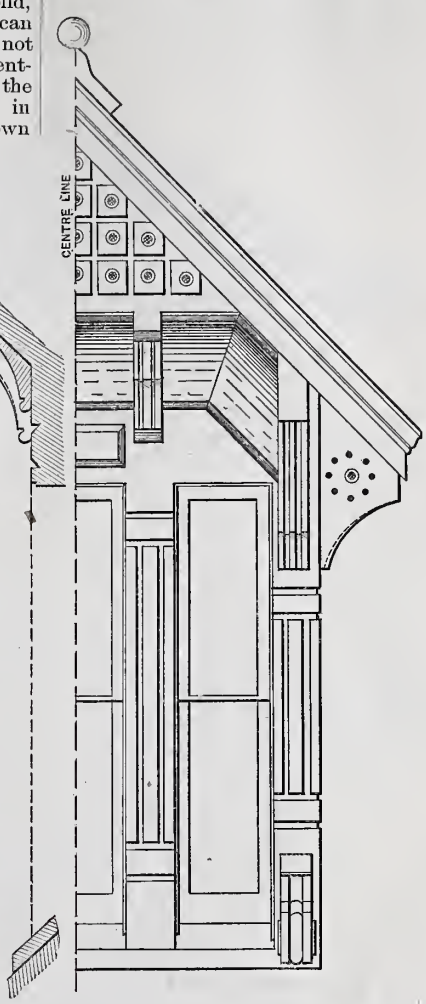



*Fig. 34.—Half Front Elevation of Dormer Window.—Scale, ½ Inch to the Foot.*

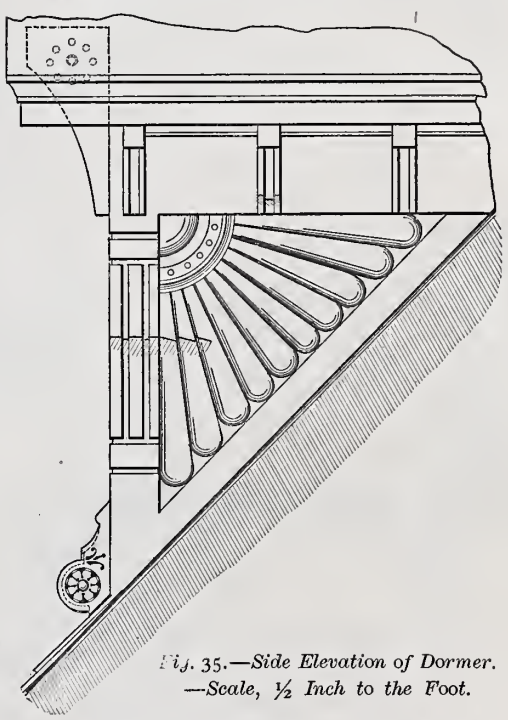
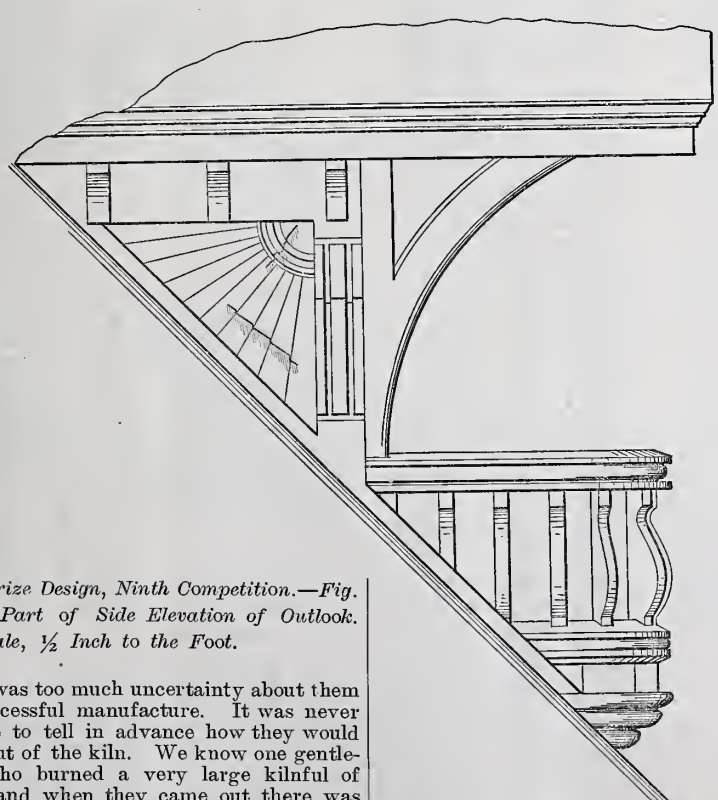


*Fig. 35.—Side Elevation of Dormer.—Scale, ½ Inch to the Foot.*



*First Prize Design, Ninth Competition.—Fig. 33.—Part of Side Elevation of Outlook.—Scale, ½ Inch to the Foot.*

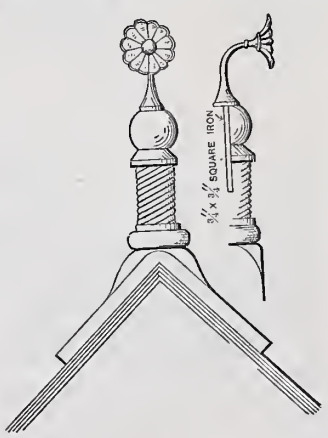
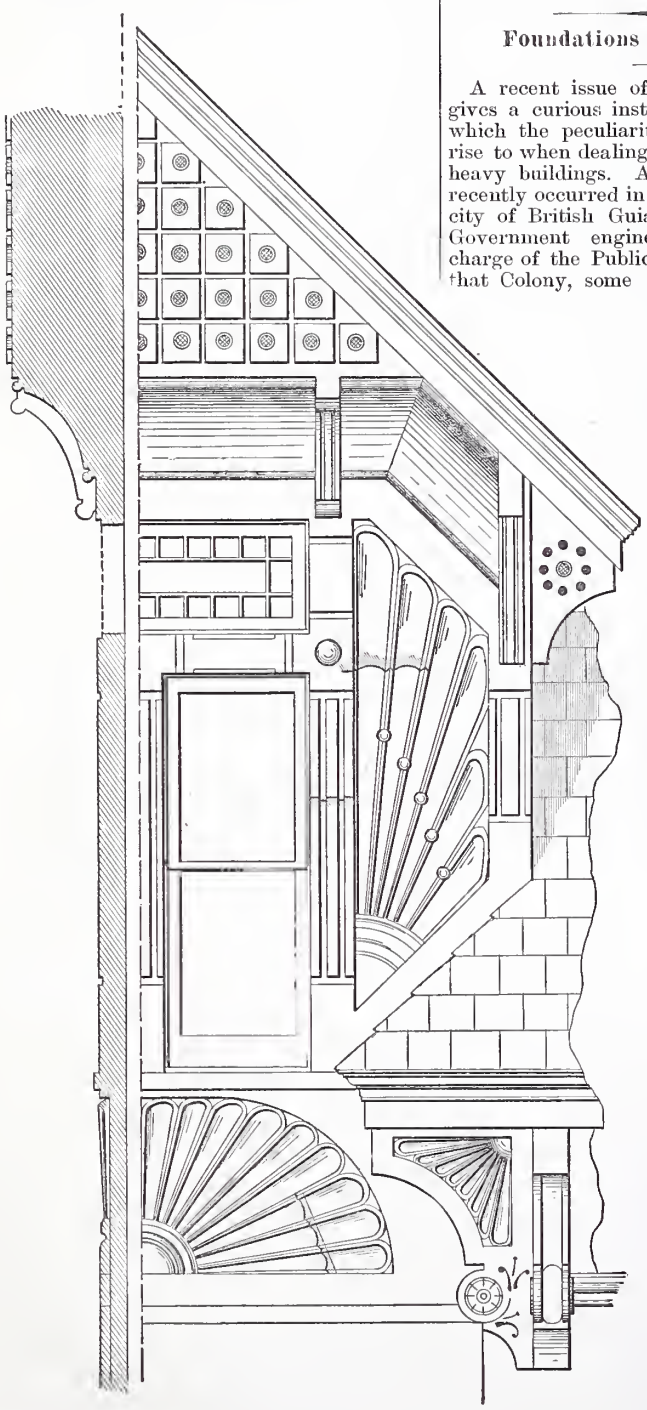



*Fig. 36.—Finial on Gable Over Dining-Room.—Scale, ½ Inch to the Foot.*

and they make the knobs cost only a little more—merely the expense of changing the center of a pattern, which is nothing on any large contract. Some clubs and insurance companies have their knobs thus ornamented. The Treasury seal is cast on all the door-knobs of the Treasury building in Washington, and on those of the post-office buildings of New York and Boston. The War and Naval departments at Washington also have their knobs ornamented with their respective seals. But the most beautiful door-knobs in Washington are in the East Room of the White House. When it was re-decorated seven or eight years ago, under Architect Mullet's supervision, new knobs were provided for the doors, window fastenings and shutters, all exquisitely enameled. The dominant color in the enameling is blue, and harmonizes well with the other beautiful adornments of the apartment.

Not a great while ago, a rich banker in Portland, Ore., sent all the way here to New York for the door-knobs for a magnificent mansion he was building. He wanted dozens of knobs, but the highest number of any one kind of the same size was three. In each room, however, the design selected for it was carried through large and small sizes, whenever a knob was used. He also had the taste to select the three shades of bronze in which fine knobs are made, so as to harmonize with the prevailing hue of the woods or decorations of the different apartments for which they were severally designed. In some old European castles and palaces one sees door-knobs of silver inlaid with gold, but such things are rarely, if ever, made now—never in this country."



*First Prize Design, Ninth Competition.—Fig. 37.—Half of Gable Over Front Bay.—Scale, ½ Inch to the Foot.*

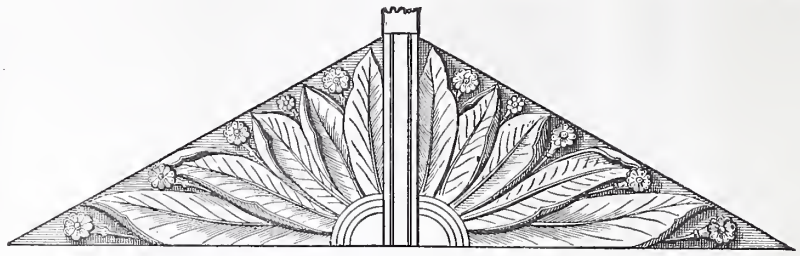


*Fig. 38.—Carved Work in Gable of Front Porch.*

## Foundations in the Tropics.

A recent issue of the London *Engineer* gives a curious instance of the difficulties which the peculiarities of tropical soil give rise to when dealing with the foundations of heavy buildings. A case illustrating these recently occurred in Georgetown, the capital city of British Guiana. Designed by the Government engineer until recently in charge of the Public Works Department of that Colony, some erections, intended for use as law courts, had proceeded to a certain point, when the successor to the office above named discovered that the buildings were bodily sinking, and this—as far as we have been able to learn—was taking place without any settlements or cracks being visible in the walls of the building, and without any disturbance of the surface soil close to them. In fact, it was not easy to detect the immediate cause of the subsidence, but it was ultimately found that at a few yards distance the ground was bulging upward. The present head of the Public Works Department in his report in no way reflects upon the character of the design given by his predecessor to the footings, or on the dimensions of the foundations. There is nothing, indeed, in these to find fault with, and the difficulty has arisen apparently from the two-fold character of the soil in the immediate vicinity of the buildings — that on which the work is erected being of good, solid, unyielding sand, but being surrounded to all appearance by a bed of earth less capable of withstanding either vertical or lateral pressure. The consequence has been that this surrounding belt of earth yielded upward to the force exerted upon it by the lateral thrust of the squeezed material immediately below the buildings.

In such a case as this there are questions of difficulty to be met which appear to be almost insurmountable unless the surrounding soil which has been lifted can be weighted down. We do not mean to say, continues the *Engineer*, that an occurrence of a similar nature to this is never met with in European practice, but it is exceptionally rare, whereas engineers in the tropics find themselves often troubled after this manner. Instances are particularly frequent in localities where, as in the seaboard provinces of British Guiana, the whole of the soil between the base of the inland mountains and the sea has been formed by alluvial deposit. The rivers, the discharge of which has brought down through countless ages the detritus of their inland course, have brought with them also immense masses of uprooted timber from the forests of the interior. These last becoming from some accidental circumstance deposited in great quantity in some particular spot, and having been covered in their turn by later layers of silt, have lain for centuries, perhaps, until the process of their decay has been completed, with the result that they shrink within the matrix wherein that process has been accomplished. It is easy to realize how the selection of apparently firm soil in the neighborhood of some such undetected spot might lead to such a result as has caused the bodily settlement of the new buildings to which we have above referred; and it would be almost impossible, unless very deep trenches were cut in all directions radiating from the proposed site of any building, to discover the presence of the danger, which only shows itself when work has proceeded to an extent which renders it economically impossible to counteract it. The only course, it appears to us, which is open to the engineer in charge, is to underpin the foundations to a depth which shall insure the lateral pressure being transmitted to firm soil below the level of the treacherous layer.

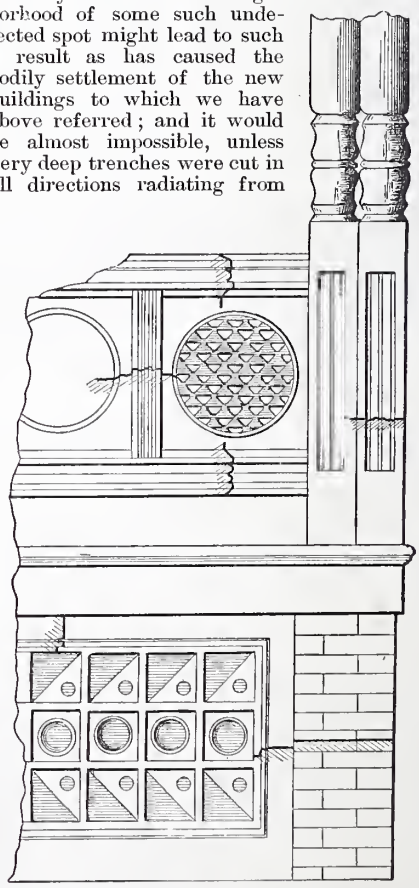
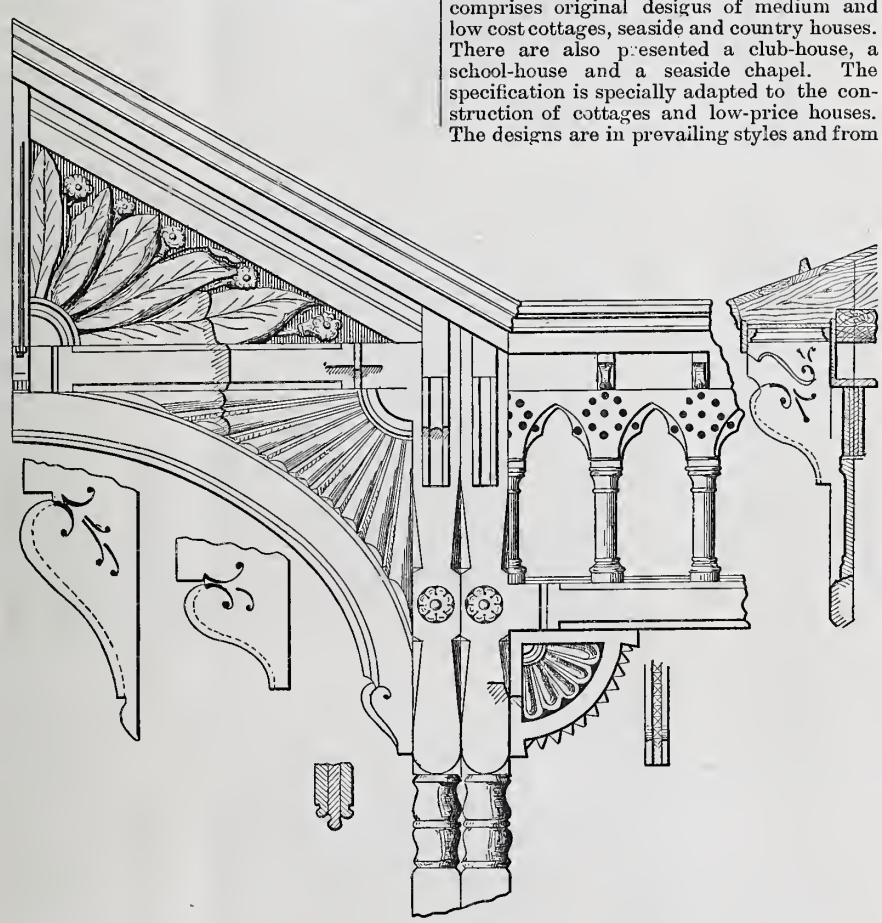


*Fig. 39.—Base of Front Porch.—Scale, ½ Inch to the Foot.*

Such an operation must doubtless in many instances entail great outlay, and, even if

successful, the reduced level of the building cannot be amended, and the original design may have to be entirely altered, if such reduced level rendors the building liable to be entered by flood water, or become otherwise unsuitable. Numerous instances of this upheaval of the soil have been noticed by us in tropical countries, and it has been the cause of failure with many of the old Dutch and Portuguese buildings so constantly met with in our East Indian possessions. Our predecessors in such countries of those nationalities sought to overcome the treacherous character of the soils with which they had to deal, by enormous thickness of walling and spread of foundation. Many of these buildings, indeed, that we have examined have had walls of what seemed to be greatly unnecessary thickness; but they proved, on opening them, to consist of only outer casings of brickwork filled in with earth. In seeking to thus give spread to their earth base, and obtain what seemed to



*First Prize Design, Ninth Competition.—Fig. 40.—Details of Upper Part of Front Porch. —Scale, ½ Inch to the Foot.*

the old builders the requisite large area of bearing, they were indeed committing the very fault certain to bring about the results they sought to avoid, but the true cause of which they do not seem to have been able to appreciate. They simply increased the evil by building weak walling of quite useless weight, instead of erecting on a wide foundation base, with reducing footings, work of the strongest but lightest character. It needs some long experience of work under the conditions which tropical soils present before the advisability of light walling becomes forced upon the engineer, and it is doubtless largely to this want of experience that so many failures of barracks and other buildings erected by military engineers in India and elsewhere are due. It is admitted that the fierce heat of the sun is more felt in a building having thin walls exposed to its rays, but then it is rarely the case that they are so exposed, or at all events they never should be, but should in all cases be sheltered by verandas.

The alternations in the tropics between rain and sun are not frequent, and the soil, deprived of moisture for months together, shrinks to an extent quite unknown in European practice. Our observations have led us even to believe that in instances watched by us the normal level of some buildings has varied to an extent of fully 2 inches between the dry and wet seasons. This lift and fall in a high erection must, of course, throw immense strain on every part of the structure, and will account for many instances of failure where the blame has been thrown on the designer. To meet such strains mere massive work is useless, and only adds to the liability of failure. First-class bonded work of light character, having well-stepped and broad foundations, is the only thing by which the effects of such strains may be safely borne.

## NEW PUBLICATIONS.

American Cottages. Consisting of 44 large quarto plates containing original designs, together with form of specification for cottages. Published by William T. Comstock. Price, $5.

This volume, which is one of the latest additions to the literature of architecture, comprises original designs of medium and low cost cottages, seaside and country houses. There are also presented a club-house, a school-house and a seaside chapel. The specification is specially adapted to the construction of cottages and low-price houses. The designs are in prevailing styles and from drawings of a number of prominent architects. Nineteen authors' names appear in the list in the front of the book. Their residences, however, are comprised in a much smaller number of towns. We notice New York, Brooklyn and Albany in this State, and Newark, Elizabeth and Princeton in New Jersey. The designs are shown mostly by perspective views, elevations and plans. Details are given in only one or two cases. The plates are photo-lithographic reproductions from authors' originals, and the scale varies according to the size of the original and the necessity for adapting the plates to the limitations of the page on which they are printed. The buildings shown have in some cases been actually erected, and memoranda of their locations appear in the plates.

Architectural Foliage Adapted from Nature. By Joseph Barlow Robinson, sculptor. Published by J. O'Kane. 36 quarto plates. Price, $3.

This is a collection of plates in portfolio cover, the plates measuring 10¾ x 12¾ inches. The selection comprises designs for capitals, bosses, crockets, finials, diapers, corbels, &c., adapted to the enrichment of buildings, monuments, furniture and the like. It is one of those portfolios of designs which artists and mechanics in various lines find valuable as a companion to their work. The plates are lithographic, and the execution is very good. The contrast of light and shade is fully up to the average of works of this character.

Practical Guide to Scene Painting and Painting in Distemper. By F. Lloyds. With illustrations drawn by the author. Published by Jesse Haney & Co. Pamphlet cover; size, 7 x 10 inches; 90 pages. Price, $1.

This is a cheap American edition of a somewhat expensive English work that has enjoyed a considerable measure of popularity in this country. The original work, if we mistake not, retails for about $5. The reprint is quite as handsome as the original edition, and, although it is classed as a cheap work, it is in clear type, with adequate illustrations and printed upon good quality of paper with wide margins. In the book directions are given for all the implements and materials required in scene painting, including the construction of scaffolding, or, rather, the "painting bridge," as it is called. Directions with reference to the use of colors are also contained, and instructions for the preparation of canvas are given. These directions precede the actual work of delineating the design upon the scene. The work is practical in all particulars, and cannot fail to interest those who have occasion to seek information of this general character.

Hand-Saws—Their Use, Care and Abuse How to Select and How to File Them. By Fred. T. Hodgson. Published by the Industrial Publication Co. Size, 5 x 7 inches; 96 pages; 75 engravings. Price, $1.

This book, as the auther very plainly states in his preface, is mainly a compilation and adaptation of other works which have preceded it. He gives a list of the books to which he has been indebted, among which may be mentioned Wilkinson's "Egyptian Antiquities;" Beckman's "History of Inventions;" Worssam on "Mechanical Saws;" Holtzapffel's "Turning and Mechanical Manipulation;" Knight's "Mechanical Dictionary;" "Encyclopedia Brittanica;" Richards's "Wood-Working Machinery," and "Grimshaw on Saws." He also mentions several of the current mechanical journals as being sources of information. An idea of the scope of the work can be as well conveyed by mentioning the chapter headings as by any other plan. They are as follows: "History of the Saw;" "Philosophy of the Cutting Qualities of Saw-Teeth;" "How to Use Hand-Saws;" "Filing and Setting Hand-Saws;" "The Use of Miscellaneous Saws;" "Remarks on Files, Sets and other Appliances," and "Memoranda on Saw Gauges, Miter Boxes, &c." This work has been carefully prepared by a practical author, and aside from the fact that the illustrations are very inferior, being reproductions from indifferent originals, it is a desirable handbook for use by amateurs and apprentices. The practical carpenter and builder are likely to obtain many hints from it, which, applied in his every day business, cannot fail to be of advantage to him.

An announcement has recently been made in the English newspapers by W. M. Flinders Petrie in regard to the tools used by the ancient Egyptians in stone-cutting, which is the most novel piece of information communicated to the mechanical world for a generation. It is, in effect, that the ancient Egyptians, in their stone-cutting, used the equivalent of the diamond drill and diamond saw. What particular gem was used for the cutting points is not at present decided, but it was probably either a sapphire or beryl in only the softer stones, for in the harder ones the experiments made show that their edges crumbled with far less pressure than is necessary to take the cuts which are everywhere found common. Not only was the diamond saw used, but the hollow drill for removing a core, and samples of these cores have been illustrated by Mr. Petrie. Only one side of the question has yet been heard, but from examples shown one would expect that there was little to be said on the other side of the question. The wonder is that the discovery was not made years ago. We hardly see how any one could have examined stonework produced in this manner without discovering the character of the tools used.

## Third Prize Estimate.*

BY EDEN BECHTEL.

(*Concluded from page* 141.)

Amounts of Millwork brought forward..... $1148.64.

BRACKETS.

At per piece.

| | | | | | |
|---|---|---|---|---|---|
| Main roof— | 78 | brack., | 3 in. x 9 in. x 4 ft. lg., at 36¢ = | $28.08 | |
| " | 3 | " | 3 in. x 9 in. x 6 ft. lg., at 54¢ = | 1.62 | |
| Dormers— | 22 | " | 3 in. x 6 in. x 3 ft. lg., at 18¢ = | 3.96 | |
| Gables— | 4 | " | 6 in. x 36 in. x 36 in., at $2.16 = | 8.64 | |
| " | 4 | " | 3 in. x 12 in. x 12 in., at 12¢ = | .48 | |
| Porches— | 24 | " | 4 in. x 9 in. x 18 in., at 36¢ = | 8.64 | |
| " | 14 | " | 3 in. x 9 in. x 48 in., at 20¢ = | 2.80 | |
| Gab. porch. | 16 | " | 3 in. x 9 in. x 9 in., at 12¢ = | 1.92 | |
| B. window— | 4 | " | 3 in. x 18 in. x 48 in., at 72¢ = | 2.88 | |
| Hoods— | 30 | " | 3 in. x 4 in. x 48 in., at 16¢ = | 4.80 | |
| | | | | | 63.82 |

BALUSTRADE.

At per sq. ft.

| | | | |
|---|---|---|---|
| South bay. | 14 ft. 0 in. x 1 ft. 6 in. x 2 in. thick | = 480 sq. ft., at 10¢ | 48.00 |
| Gable..... | 17 ft. 6 in. x 2 ft. 6 in. x 2 in. thick | | |
| Piazzas... | 81 ft. 0 in. x 2 ft. 2 in. x 2 in. thick | | |

MOLDINGS.

At per 1 in. of 100 ft.

| | | | | | | |
|---|---|---|---|---|---|---|
| White pine. | For base..... | 180 ft. | 2½ in. x 2½ in. | | = 1,125 | |
| | String course.. | 180 ft. | 1 in. x 4½ in. | | = 810 | |
| | " | 110 ft. | 1 in. x 3 in. | | = 330 | |
| | Gables..... | 76 ft. | 2 in. x 3 in. | | = 456 | |
| | Piazza..... | 76 ft. | 1 in. x 3 in. | | = 228 | |
| | Kitch. & laud'y | 212 ft. | 1 in. x 2 in. | | = 424 | |
| | Bathroom..... | 24 ft. | 1 in. x 2 in. | ash = | 48 | |
| | | | | | 3,373 | 48 |

3,373 ft. of 1 in., at $0.84 per 1 in. of 100 ft. =..... $28.33
48 ft. of 1 in., at $1.66 per 1 in. of 100 ft. =..... .79
29.12

SUNDRIES.

At per piece.

| | | | |
|---|---|---|---|
| 15 posts, 9 in. x 9 in., 9 ft., at $4.86 =..... | | $72.90 | |
| 2 " 9 in. x 9 in., 4 ft., at 2.16 =..... | | 4.32 | |
| 3 " 6 in. x 6 in., 4 ft., at 0.96 =..... | | 2.88 | |
| 88 lin. ft. cresting, at 8¢ =..... | | 7.04 | |
| | | | 87.14 |

LABOR.

Cost of millwork. [Take 25 per cent. of millwork for putting up work.]

| | | |
|---|---|---|
| Window frames..... | $147.24 | |
| Blinds..... | 94.52 | |
| Sash..... | 90.96 | |
| Doors..... | 194.06 | |
| Jamb casing..... | 38.44 | |
| Architraves..... | 107.59 | |
| Plinths, &c..... | 18.40 | |
| Base..... | 57.69 | |
| Dado..... | 134.80 | |
| Wainscot..... | 25.68 | |
| Stairs, front..... | 168.77 | |
| " rear..... | 13.35 | |
| " arch in hall..... | 7.90 | |
| Bath tub..... | 3.40 | |
| Planed lumber..... | 45.84 | |
| Brackets..... | 63.82 | |
| Balustrade..... | 48.00 | |
| Moldings..... | 29.12 | |
| Sundries..... | 87.14 | |
| | 1376.72 | |
| $1376.72 + 25 per cent. = ..... | | 344.18 |
| Total millwork..... | | $1720.90 |

### Tin Roofers' Work.

[Take guttering and spouting at per ft. run, put in. Take valleys at per superficial ft. laid, and goose necks and flashings at per piece.]

Guttering and spouting—
167 lin. ft. 5 in. guttering, at 30¢ = ..... $50.10
96 lin. ft. 4 in. galvanized spouting, at 25¢ =..... 24.00
5. lin. ft 2 in. " at 15¢ =..... .75

Valley tin—
237 sq. ft. valley tin, 20 in., at 10¢ =..... $23.70

Goose-necks and flashings—
Four 4 in. lead goose necks, at $2.50 =..... $10.00
One 2 in. " " at 1.25 =..... 1.25
90 flashings, at 3¢ =..... 2.70
Total tin roofers' work..... $112.50

### Hardware and Ironwork.

[State quantity, size, kind and quality.]

LOCKS AND KNOBS.

1st story—
One 5½-in. mortise, front-door lock and vestibule latch, bronze face and bolt, nickel keys, with bronze furniture, at..... $4.00

Amount forward..... $1.00

Amount brought forward..... $4.00
One 3-in. mortise night latch, bronze face and bolt, nickel key, with bronze furniture, at..... 1.50
One 5½-in. mortise sliding door lock, brass face and bolt, nickel key, with flush bronze furniture, at..... 6.00
One 5-in. rabbeted mortise lock, brass face and bolt, nickel key, with bronze furniture, at..... 4.00
Four 5-in. mortise locks, brass face and bolt, nickel key, bronze furniture, at $2.50 each = ..... 10.00
Two 5-inch mortise locks, bronze face, brass bolt, nickel key, bronze furniture, at $3 each = ..... 6.00
Four 5-in. mortise locks, brass face and bolt, nickel key, mineral knobs, at $2 each = ..... 8.00
Two 3-in. rim dead locks, iron bolt and key, at 25¢ each = ..... .50
2d story—
Seven 5-in. mortise locks, brass face and bolt, nickel key, with nickel-plated furniture, at $2 each = .. 14.00
Two 5-in. mortise locks, brass face and bolt, nickel key, with mineral knobs, at $1.50 each = ..... 3.00
Five 3-inch rim dead locks, iron bolt and key, at 25¢ each = ..... 1.25
Attic and basement—
Five 4½-in. mortise locks, iron front and bolt, brass key, with mineral knobs, at $1.25 each = ..... 6.75
Drawer and pantry—
12 iron tumbler drawer locks, at 40¢ each = ..... 4.80
6 pantry locks, at 40¢ each = ..... 2.40
72.20

HINGES.

1st story—
16 pairs, 4 in. x 4 in., acorn tipped, ornamental, bronzed iron loose joint butts, at $1 each = ..... $16.00
7 pairs 3 in. x 3 in. plain japanned loose joint butts, at 30¢ each = ..... 2.10
6 pairs 2 in. x 2 in. plain japanned loose joint butts, at 15¢ each = ..... 1.90
2d story—
11 pairs 3½ in. x 3½ in. japanned, acorn-tipped loose pin butts, at 75¢ each = ..... 8.25
3 pairs 3 in. x 2 in. plain japanned loose pin butts, at 30¢ each = ..... .90
Attic and basement—
7 pairs 3 in. x 3 in. plain japanned loose joint butts, at 30¢ each = ..... 2.10
Blinds—
88 pairs 3 in. x 3 in. wrought-iron loose joint butts, at 30¢ each = ..... 25.40
34 pairs 2-in. planished bronze butts, at 12¢ each = 4.08
34 pairs 1⅛-in. " " at 8¢ each = 2.72
Washstands—12 pairs 2-in. brass butts, at 15¢ each = 1.80
65.25

BOLTS, SASH FASTS, &C.

| | |
|---|---|
| 2 bronzed flush bolts, at 90¢ each = ..... | $1.80 |
| 44 pairs Shedd's patent shutter fasts, at 25¢ each = .. | 11.00 |
| 44 pairs rings and staples, at 1¢ per pair = ..... | .44 |
| Four 6-in. iron sheaves, at $1.25 each = ..... | 5.00 |
| 12 5/16 ft. x 2 in. iron track, at 50¢ per ft. = ..... | 6.00 |
| 12 spring catches, at 5¢ each = ..... | .60 |
| 1 gross wire hat and coat hooks, at $1.25 per gross = | 1.25 |
| 15 plain japanned sash fasts, at 10¢ each =..... | 1.50 |
| 16 ornamental bronzed fasts, at 20¢ each =..... | 3.20 |
| 18 japanned shutter bars, at 2¢ each =..... | .36 |
| 3 doz. ebony knobs, at 15¢ per doz. =..... | .45 |
| 7 doz. 2-in. bright hooks and eyes, at 15¢ per doz. = .. | 1.05 |
| ½ doz. padlocks, at 15¢ each =..... | .90 |
| 10 hank best B sash board, at 80¢ per hank =..... | 8.00 |
| 1,500 lbs. sash weights, at 2¢ per lb. =..... | 30.00 |
| 3 hasps and staples, at 25¢ each =..... | .75 |
| 18 ebonized wood handles, at 3¢ each =..... | .54 |
| 10 gross screws, at 18¢ per gross =..... | 1.80 |
| | 74.64 |

NAILS.

[Take 100 lbs. nails to every 4000 ft. lumber, and 6 lbs. shingling nails to every 1,000 shingles. Refer to carpenter and millwork.]

| | |
|---|---|
| White pine lumber..... | 16,988 |
| Hemlock lumber..... | 13,621 |
| Flooring and matched boards..... | 7,202 |
| Planed boards..... | 3,191 |
| Siding..... | 2,146 |
| Interior finish..... | 5,600 |
| | 48,748 |
| 48,748 ÷ 4,000 = 13 kegs nails, at $3.50 =..... | 45.50 |
| Shingles—On sides..... | 6,895 |
| " —On roofs..... | 16,092 |
| | 22,987 |
| 22,987, or nearly 23 M, ÷ 6 lbs. per M = 138 lbs., at 4¢ = | 5.52 |

IRONWORK.

| | |
|---|---|
| 1 wrought-iron grille, at $5 = ..... | $5.00 |
| 12 bars for chimneys, at 15¢ = ..... | 1.80 |
| 1 sun dial and fixtures, at $5 = ..... | 5.00 |
| 9 wrought-iron wire guards, at $2 = ..... | 18.00 |
| 3 ashpit frames, at $1 = ..... | 3.00 |
| Amounts forward..... | $32.80 263.11 |

* For elevations and details, see *Carpentry and Building* for July, 1882. For specification of materials and labor, and see "Star" in October issue for 1882.

Amounts brought forward.....$32.80 263.11

7 wrought-iron finials, at 75¢ = ..... 5.25
1 " cover and frame, at $2 = ..... 2.00
3 cast-iron gratings, at $3 = ..... 9.00
4 " crocks, at 50¢ = ..... 2.00
Anchors, tie rods, &c..... 5.00
—— 56.05

Total hardware and ironwork.....$319.16

### Plasterers' Work.

[Measure by the sq. yd. superficial, and deduct openings when they exceed 50 sq. ft. Take cornices at per lineal, by the girth measure For the length of cornice, take distance around room against wall, and for girth press the line close to the surface. State how work is to be done.]

PLASTERING.

Two-coat work :

1st story.

| | | |
|---|---|---|
| Parlor and library. | 70 ft. 0 in. x 10 ft. x 2 | |
| Par. & lib. ceiling. | 15 ft. 0 in. x 19 ft. x 2 | |
| Kitchen and closet. | 170 ft. 6 in. x 7 ft. 0 in. | |
| Kitchen ceiling.... | 23 ft. 0 in. x 16 ft. 6 in. | |
| Rear hall ..... | 27 ft. 0 in. x 5 ft. 0 in. | |
| Toilet..... | 4 ft. 0 in. x 7 ft. 6 in. | |
| Dining-room..... | 62 ft. 0 in. x 6 ft. 6 in. | |
| " ceiling | 15 ft. 0 in. x 14 ft. 0 in. | |
| " " | 11 ft. 0 in. x 4 ft. 0 in. | |
| Hall and vestibule. | 17 ft. 0 in. x 6 ft. 9 in. | |
| " " | 7 ft. 6 in. x 4 ft. 9 in. | |
| " " | 26 ft. 0 in. x 7 ft. 0 in. | |
| " " | 10 ft. 0 in. x 7 ft. 6 in. | |
| 2d story and attic..... | 89 ft. 0 in. x 5 ft. 9 in. | = 12,314 sq. ft. |
| " " | .... 26 ft. 0 in. x 7 ft. 0 in. | |
| " " | ....138 ft. 0 in. x 8 ft. 0 in. | |
| " " | .... 15 ft. 0 in. x 7 ft. 6 in. | |
| " " | .... 7 ft. 0 in. x 3 ft. 0 in. | |
| " " | ....199 ft. 6 in. x 9 ft. 0 in. | |
| " " | .... 16 ft. 0 in. x 10 ft. 0 in. | |
| " " | .... 58 ft. 0 in. x 7 ft. 6 in. | |
| " " | .... 22 ft. 0 in. x 18 ft. 0 in. | |
| " " | .... 15 ft. 0 in. x 53 ft. 0 in. | |
| " " | .... 28 ft. 0 in. x 5 ft. 0 in. | |
| " " | .... 11 ft. 0 in. x 3 ft. 0 in. | |
| " " | .... 22 ft. 0 in. x 16 ft. 0 in. | |
| " " | ....111 ft. 0 in. x 9 ft. 0 in. | |

12,314 sq. ft. ÷ 9 = 1,268 sq. yds., at 26¢ per yd. =..... 329.68

*Analysis of Cost of "Two-Coat Work" per Yard.*

To plaster 50 yds. it will require :

| | | |
|---|---|---|
| 850 | lath.... | $3.05 |
| 7 | pounds nails..... | .42 |
| 5 | bushels lime..... | 1.80 |
| 1 | " hair..... | .40 |
| ½ | load sand (1 load sand = 27 cu. ft.)..... | .80 |
| ⅛ | bbl. plaster..... | .30 |
| 1 | day for plasterer..... | 3.00 |
| 1 | " laborer..... | 2.25 |
| Lathing. | ..... | 1.00 |
| | | $13 02 |

$13.02 ÷ 50 yds. = 26¢ per yd.

Rough coat work—

| | | |
|---|---|---|
| Basement..... | 93 ft. x 4 ft. 6 in. | = 3345 sq. ft. |
| " ..... | 16 ft. x 15 ft. | |
| " ..... | 8 ft. x 4 ft. | |
| Between studs..... | 90 ft. x 10 ft. | |
| " ..... | 66 ft. x 3 ft. | |
| " ..... | 93 ft. x 9 ft. | |
| " ..... | 60 ft. x 3 ft. | |
| " ..... | 90 ft. x 6 ft. | |

3345 sq. ft. ÷ 9 = 372 sq. yds. at 21⅕¢ per yd. = ..... 78.86

*Analysis of Cost of "Roughing-on Work" per Yard.*

To plaster 50 yds. it will require

| | | |
|---|---|---|
| 850 | lath..... | $3.05 |
| 7 | pounds nails..... | .42 |
| 4 | bushels lime..... | 1.44 |
| 1 | bushel hair..... | .40 |
| ½ | load sand..... | .80 |
| Lathing... | ..... | 1.00 |
| ⅔ | day plasterer..... | 2.00 |
| ⅔ | day laborer ..... | 1.50 |
| | | $10.61 |

$10.61 ÷ 50 yds. = 21⅕¢ per sq. yd.

CORNICES AND CENTER-PIECES.

Cornice—Dining room and hall, 143 lin. ft., 12 in. girth, at 20¢ = .....$28.60
" Library and parlor, 140 lin. ft., 15 in. girth, at 25¢ = ..... 35.00
Center-pieces—4 centers, at $3.50 = ..... 14.00
" 2 brackets, at 87½¢ = ..... 1.75
—— 79.35

Total plasterer's work.....$487.89

### Plumbers' Work.

[Take all pipes at per lin. ft. State diameter, and in lead pipe give the weight per ft. Take all connections, cocks, &c.. at per piece. Take linings at per sq. ft.

DRAIN PIPE.

75 ft. 6-in. T. C., at 20¢ per ft. = .....$15.00
60 ft. 4-in. " at 15¢ per ft. = ..... 9.00
18 ft. 3-in. " at 11¢ per ft. = ..... 1.98

Amount forward.....$25.98

Amount brought forward.....$25.98

One 6-in. bend T. C., at 75¢ per piece = ..... .75
Three 4-in. " at 40¢ " = ..... 1.20
One 3-in. " at 32¢ " = ..... .32
One 6-in. S trap, T. C., at $2.25 per piece = ..... 2.25
Three 4-in. " at $1.35 " = ..... 4.05
One 3-in. " at 75¢ " = ..... .75
—— 35.30

IRON PIPE.

71 ft. 2-in. soil pipe, at 15¢ per ft. =.....$10.50
6 ft. 3-in. soil pipe, at 20¢ per ft. =..... 1.20
90 ft. 4-in. soil pipe, at 26¢ per ft. =..... 23.40
Three 4-in. Y's, at 45¢ per piece =..... 1.35
Two 2-in. Y's, at 25¢ per piece =..... .50
Three 4-in. ¼ bends, at 42¢ per piece =..... 1.26
One 4-in. ⅛ bend, at 42¢ per piece =..... .42
One 2-in. ¼ bend, at 25¢ per piece =..... .25
Two wrought-iron caps, at 50¢ per piece =..... 1.00
—— 39.88

LEAD PIPE.

| | |
|---|---|
| Supply, 206 ft. ¾-in., 3 lbs. per ft =..... | 618 lbs. |
| Basins, 108 ft. ½-in., 1½ lbs. per ft =..... | 162 lbs. |
| Waste, 68 ft. 1½-in., 4 lbs. per ft. =..... | 272 lbs. |
| Waste, 10 ft. 1-in., 3 lbs. per ft. =..... | 30 lbs. |
| Reservoir, 8 ft. 2-in., 4 lbs. per ft. =..... | 32 lbs. |
| | 1,114 lbs. |

1,114 lbs. of lead pipe, at 7¢ per lb. =.....$77.98
Traps, two 4-in. P traps, at $2.20 =..... 4.40
Traps, seven 2-in. P traps, at $1.10 =..... 7.70
—— 90.08

SHEET COPPER, LEAD AND ZINC.

36 sq. ft. sheet lead, 3 lbs. per ft. = 108 lbs., at 7¢ = $7.56
86 sq. ft. 14-oz. planished copper, at 30¢ per sq. ft. =. 25 80
22 sq. ft. 12-oz. sheet zinc, at 15¢ per sq. ft. =..... 3.30
—— 36.66

WATER-CLOSETS, ETC.

1 enameled Tucker short hopper, enameled trap and fittings, at $12 =.....$12.00
1 No. 2 waste-preventing cistern, with fittings, at $5 = 5.00
1 Demarest oval short flushing rim, glazed earthenware hopper and trap, with fittings, at $14 = .... 14.00
1 iron service box, with fittings, at $4 = ..... 4.00
One 5-ft. 16-oz. tinned copper bath tub, with plug, chain and strainer, at $15 = ..... 15.00
Four 14-in. Wedgewood basins, with plug, chain and strainer, at $2 = ..... 8.00
Four 20 in. x 2 ft. 6 in. countersunk Tennessee marble tops, molded edges and clamps for basins, with side and backs 12 in. high, at $6 each = ..... 24.00
—— 82.00

SINKS, BOILER, &C.

1 planished copper sink, 14 in. x 20 in., 6-in. oval bottom, with plug and chain, at $8 = ..... $8.00
Two 2 ft. x 2 ft. soapstone washtubs with fittings, at $7.50 = ..... 15.00
1 soapstone sink, 22 in. x 42 in. x 6 in., at $5 = . ... 5.00
One 40-gal. cop. boiler, with brass couplings, at $30 = 30 00
Five ¾-in. comp. bibbs, at $1 = ..... 5.00
One ¾-in. " screw nozzle, at $1.15 = .... 1.15
Three ¾-in. brass stop and waste, at $1.25 = ..... 3.75
Two ¾-in. pitcher cocks, silver plated, at $1.75 = ... 3.50
Two ¾-in. comp. bibbs, silver plated, at $2 = ..... 4.00
Eight ½-in. basin cocks, silver plated, at $1.90 = ... 15.20
One ¾-in. brass stop, sil. plated (at tank), at $1.60 = 1.60
1 Blank's single-acting force pump, complete, with supply from cistern and discharge to tank, at $35 = 35.00
—— 127.20

SUNDRIES.

50 lb. solder, at 13¢ = ..... $6.50
5 doz. metal tacks, at 30¢ = ..... 1.50
4 lb. gaskett, at 10¢ = ..... .40
10 lb. putty, at 3¢ = ..... .30
2 gross screws, at 25¢ = ..... .50
—— 9.20

LABOR.

[For labor in plumbing, take 33⅓ per cent. of cost of material.]

| | | |
|---|---|---|
| Cost of material— | Drain pipe..... | $35.30 |
| " | Iron pipe ..... | 39.88 |
| " | Lead pipe..... | 90.08 |
| " | Sheet copper, &c..... | 36.66 |
| " | Water-closets, &c..... | 82.00 |
| " | Sinks, boiler, &c.....| 127.20 |
| " | Sundries..... | 9-20 |
| | | $420.32 |

33⅓ per cent. of $420.32 = ..... 140.10

Total plumbers' work.....$560.42

### Gasfitters' Work.

[First find the number of lights required throughout the house, where located, and the number of lights or burners to each outlet. Assume them to be located as follows :]

Parlor, 1 chandelier, 6 burners = ..... 6 burners.
" 1 side light, 2 burners = ..... 2 "

Amount forward ..... 8 burners.

| | |
|---|---|
| Amount brought forward... | 8 burners. |
| Library, 1 chandelier, 4 burners = ..... | 4 " |
| " 2 side lights, 2 burners each = ..... | 4 " |
| Dining-room, 1 chandelier, 3 burners = ..... | 3 " |
| " 2 side lights, 1 burner each = .... | 2 " |
| Pantry, 1 drop, 1 burner = ..... | 1 " |
| Kitchen, 1 drop, 2 burners = ..... | 2 " |
| " 1 side light, 1 burner = ..... | 1 " |
| Front hall, 1 chandelier, 3 burners = ..... | 3 " |
| Rear hall, 1 side light, 1 burner =..... | 1 " |
| Toilet, 1 side light, 1 burner =..... | 1 " |
| Lauudry, 2 side lights, 1 burner each =..... | 2 " |
| Cellar, 2 side lights, 1 burner each =..... | 2 " |
| Three chambers, 1 chandelier, 2 burners each = | 6 " |
| " 1 side light, 1 burner each = .. | 3 " |
| One chamber, 1 side light, 2 burners = ..... | 2 " |
| Bathroom, 1 side light, 1 burner = ..... | 1 " |
| Sewing-room, 1 side light, 1 burner = ..... | 1 " |
| 2d story hall, 1 side light, 1 burner = ..... | 1 " |
| Alcove, 1 side light, 1 burner = ..... | 2 " |
| Billiard room, 2 side lights, 1 burner each = ... | 2 " |
| Play-room, 1 side light, 1 burner = ..... | 1 " |
| Total..... | 52 burners. |

[To find the diameter of pipe required. The following are the Philadelphia gas regulations :]

| Size of pipe. | Greatest length allowed. | Greatest No. of burners. |
|---|---|---|
| ¼ in..... | 6 feet. ..... | 1 burner. |
| ⅜ in..... | 20 " ..... | 3 " |
| ½ in..... | 30 " ..... | 6 " |
| ¾ in..... | 50 " ..... | 20 " |
| 1 in..... | 70 " ..... | 35 " |
| 1¼ in..... | 100 " ..... | 60 " |
| 1½ in..... | 150 " ..... | 100 " |

To supply the 52 burners in the house, it will be seen in the above table that the 1¼-in. pipe will be required for a main, as the 1-in. pipe is capable of supplying only 35 burners Now, the distance the 1½-in. main will have to be run will be until a sufficient number of burners have been taken off it, by branch pipes, to reduce the number of burners to 35, when the 1-in. pipe can be used ; but should the remaining burners be over 70 ft. distant (see table), then the 1¼-in. pipe will have to be continued until the 1-in. pipe is within the limit. (This, however, is not the case in this house.) Get all the different pipes in accordance with this rule. As no joists are to be cut, pipe must run on sides, more pipe being required.

PIPING.

At per lin. ft., labor and fittings included.

[Take the ¾-in. pipe as the standard for calculation. The quantity of pipe required, to pipe a building, smaller than ¾ in. diameter will balance the additional cost of pipe above ¾ in. Hence, it would be only necessary to take the number of ft. of the average pipe and multiply by the cost per ft., but for future reference it is well to state the number of ft. of each kind.]

24 lin. ft., 1¼ in.
18 lin. ft., 1 in.
56 lin. ft., ¾ in.
80 lin. ft., ½ in.
138 lin. ft., ⅜ in.
78 lin. ft., ¼ in.

394 ft. of pipe, at 20¢ per ft. =.....$78.80 — 78.80

*Analysis of Cost per Foot.*

1 ft. of ¾-in. pipe and fit..... 14¢
Labor..... 6¢
Total cost per ft..... 20¢

**Bell-Hangers' Work.**

[Take wire and tubes at per ft., put up. Take mouth-pieces, cranks, elbows, pulls, levers, gongs, &c., at per piece.]

SPEAKING TUBES.

| | |
|---|---|
| Tubes, &c.—185 lin. ft. tubing, at 10¢ = ..... | $18.50 |
| " 22 elbows, at 2½¢ = ..... | .55 |
| " 6 porcelain mouth-pieces, at 40¢ = ..... | 2.40 |
| " 4 " " with whistles, at 25¢ = ..... | 1.00 |

GONGS, &C.

| | |
|---|---|
| 5 lds. wire, at 12¢ = ..... | $0.60 |
| 28 cranks, at 6¢ = ..... | 1.68 |
| 2 bronze knobs and plate, at $1..... | 2.00 |
| 8 nickel-plated gongs, at $1 = ..... | 8.00 |
| 2 levers, at 75¢ = ..... | 1.50 |
| 1 foot presser..... | 1.25 |
| Screws, &c..... | 1.00 |
| Putting up bells..... | 3.00 |
| | 41.48 |
| Total bell-hanger's work..... | $41.48 |

**Heating and Ventilating.**

[Take work at per piece or per ft. put up, as the case may need.]

FURNACE AND REGISTERS.

| | |
|---|---|
| One 52-in. cast-iron portable furnace..... | $125.00 |
| Three 12 x 15 black jap'd. floor registers, at $4 = ... | 12.00 |
| Two 8 x 10 " " at $2 = ... | 8.00 |
| One 14 x 18 " registers, at $6 = ..... | 6.00 |
| Three 10 x 12 " " at $3 = ..... | 9.00 |
| One 8 x 10 " " at $2 = ..... | 2.00 |
| Three 8 x 8 white enameled registers, at $4 = ..... | 12.00 |

SOAPSTONE BORDERS.

| | |
|---|---|
| 3 borders for 12 x 15 register, at $3 = ..... | 9.00 |
| 3 borders for 8 x 10 register, at $1.25 =..... | 3.75 |
| Amount forward.....$186.75 | |

| | |
|---|---|
| Amount brought forward.....$186.75 | |
| 1 border for 14 x 18 register, at $4.50 =..... | 4.50 |
| 3 borders for 10 x 12 register, at $2 =..... | 6.00 |

PIPE.

| | |
|---|---|
| 12 ft. 8-in. smoke-pipe, at 35¢ per ft. =..... | 4.20 |
| 20 ft. 10-in. heat-pipe, at 30¢ per ft. =..... | 6.00 |
| 8 ft. 9-in. heat-pipe, at 28¢ per ft. =..... | 2.24 |
| 26 ft. 8-in. heat-pipe, at 26¢ per ft. =..... | 6.76 |
| 4 ft. 7-in. heat-pipe, at 23¢ per ft. =..... | .92 |
| 20 ft. 6-in. heat-pipe, at 20¢ per ft. =..... | 4.00 |

REGISTER BOXES.

| | |
|---|---|
| 16 tin boxes, 4 x 12, at $1 each =..... | 16.00 |
| 2 tin boxes, 4 x 8, at 75¢ each =..... | 1.50 |
| 2 tin boxes, 4 x 14, at $1.50 each =..... | 3.00 |

COLLARS, ETC.

| | |
|---|---|
| 2 collars for 6 in.-pipe to 8 x 10 reg., at $1.25 each = | 2.50 |
| 3 collars for 8 in.-pipe to 10 x 12 reg., at $1.50 each = | 4.50 |

SUNDRIES.

| | |
|---|---|
| 30 sq. ft. tin, at 6¢ =..... | 1.80 |
| 2 lds. wire, at 12¢ =..... | .24 |
| 11 dampers, at 25¢ ==..... | 2.75 |
| 11 metal tags, at 10¢ =..... | 1.10 |
| 1 cold-air box 16 ft. long, 15 in. x 26 in., with slide damper and screen, at $20 =..... | 20.00 |
| Hangers..... | .50 |
| | 275.26 |
| Total heating and ventilation..... | $275.26 |

**Painters' Work.**

[Take painting at per sq yd., glazing at per light and glass at per box of 50 ft. Measure every part that is touched by the brush. Call this "face measure." When the part that is to be painted is less than 1 ft. "face measure," it is taken the same as 1 ft., as the time consumed in "cutting" the edges will equal the paint saved. Should there be more than 1 ft., then take each color as 1 ft. by itself. State the number of coats and number of colors.]

PAINTING PIAZZA AND MAIN ROOFS.

[Two coats red lead in oil. For surface, see roof shingling.]

3151 sq. ft. in roofs.
872 sq. ft. over cornices.

4023 sq. ft. ÷ 9 = 447 sq. yds., at 9¢ per yd. =..... 40.23

METAL WORK.

[One coat red lead in oil and two coats color, to match.]

108 ft. in window guards.
15 ft. in wrought-iron grille.
15 ft. in finials.

138 sq. ft. ÷ 9 = 15½ sq. yds., at 20¢ per yd. =..... 3.10

EXTERIOR WORK.

[Two coats lead in oil, 4 colors. For surface, see side shingling, siding, cornice, &c.]

| | |
|---|---|
| 1,537 | sq. ft. side shingling, surface. |
| 2,146 | " siding surface. |
| 872 | " cornice " |
| 364 | " hood " |
| 130 | " base " |
| 358 | " eaves " |
| 901 | " frame " |
| 770 | " sash " |
| 920 | " outside blind surface. |
| 645 | " brackets, balustrade, &c., surface. |
| 1,500 | " fence surface. |

10,143 sq. ft. ÷ 9 = 1127 sq. yds., at 20¢ per yd. = ..... 225.40

PORCH CEILINGS.

[One coat orange shellac and 1 coat varnish. For surface, refer to matched boards.]

439 sq. ft. ÷ 9 = 49 sq. yds., at 27¢ per yd. = ..... 13.23

OUTSIDE BRICKWORK.

[One coat raw oil. For surface, refer to brickwork in red mortar.]

451 sq. ft. ÷ 9 = 50 sq. yds., at 4¢ per yd. = ..... 2.00

PIAZZA AND BALCONY, FLOORS, STAIRS AND MANTELS.

[Two coats raw oil. For surface, refer to flooring and planed lumber on exterior.]

| | |
|---|---|
| 545 | sq. ft. piazza and balcony floors. |
| 929 | " yel. pine inside " |
| 430 | " stairways. |
| 50 | " mantels. |

1954 sq. ft. ÷ 9 = 217 sq. yds., at 7¢ per yd. = ..... 15.19

ASH FINISH.

[Three coats white shellac, rubbed down and finished with spirits of turpentine. For surface, refer to the items in millwork.]

| | |
|---|---|
| 642 | sq. ft. architrave. |
| 674 | " dado. |
| 96 | " wainscot. |
| 109 | " base. |
| 20 | " bath tub. |
| 46 | " jamb casing. |
| 650 | " doors. |

2237 sq. ft. ÷ 9 = 248½ sq. yds., at 50¢ per yd. = ..... 124.25

Amount forward.....$423.40

Amount brought forward..... $423.40

INSIDE SASH.

[Two coats best copal.]

1305 sq. ft. ÷ 9 = 145 sq. yds., at 22¢ = ..... 31.90

PINE FINISH IN CHAMBERS, ATTIC, CHINA AND CHAMBER CLOSETS.

[Three coats white shellac, rubbed down with oil. For surface, refer to millwork.]

1241 ft. architrave.
448 ft. washboard.
155 ft. china closets.
50 ft. in washstands.
740 ft. in doors.
366 ft. of jamb casing.

3000 ft. ÷ 9 = 333⅓ yds., at 40¢ per yd. = ..... 133.33

PINE FINISH IN LAUNDRY, KITCHEN, REAR STAIRS AND BACK HALLS.

[Two coats orange shellac and 2 coats best copal. Refer to millwork for surface.]

630 sq. ft. wainscoat.
424 " architrave.
150 " sills and blinds.
370 " doors.
87 " jamb casing.
90 " in closets.

1651 sq. ft. ÷ 9 = 183½ yds., at 35¢ per yd. =..... 64.22

WALL PAINTING.

[Back hall, rear stairs, kitchen, laundry, china and kitchen closets and toilet. Prime 1 coat of litherage and 3 coats lead in oil. For surface, refer to plastering.]

690 sq. ft. in basement.
1573 sq. ft. in kitchen and kitchen closets.
165 sq. ft. in toilet and rear hall.

2428 sq. ft. ÷ 9 = 269 sq. yds., at 25¢ per yd. =..... 67.25

TINTING CEILINGS.

[Parlor, library, front hall and dining-room ceilings, 3 colors in distemper. (Refer to plastering.) 824 sq. ft. of surface in ceilings.]

824 ÷ 9 = 91½ sq. yds., at 15¢ = ..... 13.72

CORNICES.

283 lin. ft. cornice, at 8¢ =..... $22.64
140 lin. ft. border, at 6¢ =..... 8.40
4 center pieces, at $3 =..... 12.00
56.76

GLAZING.

[For size of glass and quantity, refer to sash in millwork.] Cathedral glass.—

16 sq. ft. stained glass, at $2 = ..... $32.00

D. T. German window glass—

| | | | | | |
|---|---|---|---|---|---|
| 64 lights, | 14 x 38 = 4½ | boxes, | at $6.75 = | ..... | 30.37 |
| 56 " | 14 x 32 = 3½ | " | at 6.00 = | ..... | 21.00 |
| 8 " | 20 x 32 = 1 | " | at 6.75 = | ..... | 6.75 |
| 10 " | 14 x 26 = ½ | " | at 5.00 = | ..... | 2.50 |
| 2 " | 14 x 24 = 1/11 | " | at 5.00 = | ..... | .45 |
| 40 " | 14 x 14 = 1 | " | at 5.00 = | ..... | 5.00 |
| 8 " | 13 x 26 = ½ | " | at 5.00 = | ..... | 2.50 |
| 8 " | 13 x 14 = ¼ | " | at 4.50 = | ..... | 1.12 |
| 22 " | 10 x 14 = ½ | " | at 4.50 = | ..... | 2.25 |
| 36 " | x 10 = 2/5 | " | at 4.00 = | ..... | 1.80 |
| *195 " | 9 x 15 = 4 | " | at 4.00 = | ..... | 16.00 |
| 30 " | 4 x 15 = 1 | " | at 4.00 = | ..... | 4.00 |
| 12 " | 3 x 14 = ⅓ | " | at 4.00 = | ..... | 1.33 |

491 total number of lights.

Glazing 491 lights, at 3¢ per light = ..... 14.73
142.30

* Winter Sash. Total painters' work..... $932.88

## Mantel Work.

[Take the different items as you would in getting out the parts of the mantel.]

PARLOR MANTEL.

85 ft. ash, at 10¢ = ..... $8.50
Millwork..... 30.00
Carving..... 15.00
Hardware, &c..... 1.10
Finishing..... 25.00
1 plate mirror, 12 x 30..... 5.00
2 plate mirrors, 6 x 12..... 4.00
Sienna marble and brick facing, soapstone backs and jambs, with grate complete..... 30.00
Tile hearth..... 10.00
Setting..... 16.00
144.60

LIBRARY MANTEL.

84 ft. ash, at 10¢..... $8 50
Millwork..... 28.00
Carving..... 10.00
Hardware, &c..... 1.10
Finishing..... 25.00
1 plate mirror, 12 x 30..... 5.00
2 plate mirrors, 6 x 12..... 4.00
Tile-facing soapstone backs and jambs, with grate complete..... 23.00

Amounts forward.....$104.60 144.60

Amounts brought forward.....$104.60 144.60
Tile hearth..... 10.00
Setting..... 15.00
129.60

DINING-ROOM MANTEL.

105 ft. ash, at 10¢ =..... $10.50
25 ft. ½ poplar, at 5¢ =..... 1.25
Millwork..... 35.00
Carving..... 22.00
Hardware..... 1.25
Finishing..... 30.00
1 plate mirror, 18 x 30..... 8.00
Brick facing, terra cotta panels, soapstone backs and jambs, with grate complete..... 25.00
Tile hearth..... 10.00
Setting..... 15.00
158.00

PARLOR CHAMBER MANTEL.

115 ft. white pine, at 6¢ =..... $6.90
Millwork..... 20.00
Carving..... 12.00
Hardware..... .75
Finishing..... 15.00
1 plate mirror, 15 x 27..... 7.50
Brick facing, terra-cotta panels, soapstone backs and jambs, with grate complete..... 25.00
Tile hearth..... 8.00
Setting..... 12.00
107.15

LIBRARY CHAMBER MANTEL.

Same as above..... 107.15

DINING CHAMBER MANTEL.

75 ft. white pine, at 6¢ =..... $4.50
Millwork..... 15.00
Carving..... 5.00
Hardware..... .65
Finishing..... 12.00
Black marble, brick facing, soapstone backs and jambs, terra-cotta panels, with grate complete.... 27.00
Tile hearth..... 8.00
Setting..... 10.00
82.15

Total mantel work..... 728.65

## Miscellaneous.

[This includes items which occur in the course of building, not directly connected with any of the general divisions.]

Permits, surveys, &c..... $7.50
Scaffolding..... 25.00
Protection of work..... 15.00
Rat-proofing..... 5.00
Whitewashing cellar..... 7 00
Coal bins and shute..... 9.50
Tub frames..... 4.00
Removing rubbish..... 15.00
Sodding and gravel walks..... 35.00
Building paper (refer to sheathing under hemlock)...
$123.00

1788 sq. ft. under siding.
1537 " " side shingling.
3531 " " roof and cornices.
1493 " " "

8349 sq. ft. of paper at 25¢ per C = ..... 20.87

Fence—25 posts, at 25¢ = ..... $6.35
" 1250 ft. rail, at 1½¢ = ..... 8.25
" 700 pickets, at 3¢ = ..... 21.00
" Labor..... 15.00
50.50

Insurance..... 25.00
Swill locker..... 6.50
Vegetable closet..... 10.50
Final jobbing..... 5.00
241 37

Total miscellaneous.....$241.37

## Recapitulation.

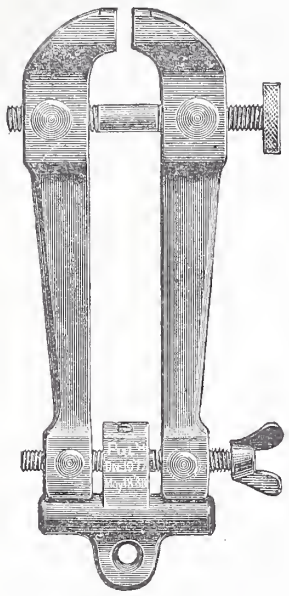
| | |
|---|---|
| Excavation..... | $167.95 |
| Masonry..... | 1,291.04 |
| Brickwork..... | 820.91 |
| Carpenter work..... | 1,977.78 |
| Millwork..... | 1,720.90 |
| Tin roofers' work..... | 112.50 |
| Plastering..... | 487.89 |
| Hardware..... | 319.16 |
| Plumbing..... | 560.42 |
| Gas-fitting..... | 78.80 |
| Bell hanger..... | 41.48 |
| Heating and ventilation..... | 275.26 |
| Painting..... | 932.88 |
| Mantels..... | 728.65 |
| Miscellaneous..... | 241.37 |
| Net cost of building..... | $9,756.99 |

To this must be added whatever profit the builder wishes to make.

## NOVELTIES.

### Compound Hand-Vise.

Fig. 1 represents a form of compound parallel hand-vise which has a very unusual gripping power without complicated mechanism, and at the same time works with parallel jaws. Two similar jaws are made with pins passing through near the top and bottom. Each pair of pins is drilled and tapped to receive a right and a left hand



*Novelties.—Fig. 1.—Compound Power Hand-Vise.*

screw. By turning the upper screw in one direction or the other the jaws are made to open and shut. The lower screw, of course, acts on the lower end of the vise in the same manner. Turning the top of the upper screw from one causes the jaws to approach, and turning the top of the lower screw in the same direction produces the same effect on the jaw by separating the vise at the bottom. In this the jaws are closed by the upper screw as firmly as possible by the thumb and finger. The final grip is then given by turning the screw at the bottom, the vise working in this respect precisely like the hand clamp of the carpenter. The amount of power obtained by means of the thumb and finger appears to be out of all proportion to the strain exerted, and the grip of the tool is really astonishing. At the bottom the two parts of the vise are connected by a T-shaped piece having a slot into which the ends pass. This slot is not shown in the engraving. The nuts being in the form of pins, of course enables the screw to work parallel at any angle without binding. The capacity is unusually large, the 6-inch vise jaws opening nearly 11-16ths of an inch, and having as firm a grip at the full opening as when nearly closed. To illustrate the grip of the vise we screwed it on to a vertical plate of iron ½-inch thick and set it up nearly with the force of the thumb and fingers. A weight of 125 pounds at the outer end of the vise was barely sufficient to cause the jaws to slip. This is certainly a greater gripping force than any hand-vise with which we are acquainted. Some of the chief claims for points of superiority in this tool are the small quantity of material, the symmetry, facility of operation, the parallelism of the jaws, and the enormous power.

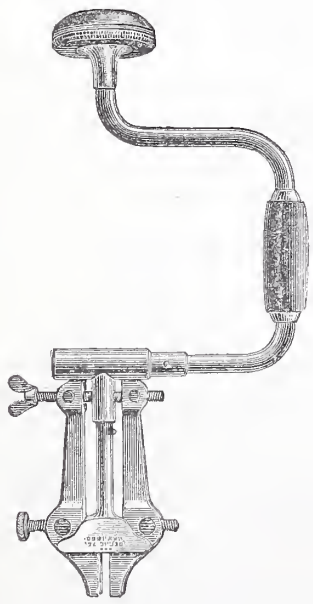


*Fig. 2.—Compound Power Brace-Wrench.*

A very neat application of this tool has been made to carpenters' vises, hand-drills, &c., and is shown in Fig. 2. The bottom or back of the vise is prolonged and secured to an ordinary brace handle, and the jaws are held by the T-shaped projection, which is prolonged nearly to the lower end of the vice. In this form it will take in bit, broken tool, round, flat, square or three-cornered, and hold it firmly. This size has a range from the smallest up to 1¼-inch nut or bolt, and, we should judge, would be an exceedingly convenient and handy tool. Both this form and the hand-vise are made entirely of steel, and the manufacture is carried on in such a way that the parts are all interchangable, and when broken can be replaced without difficulty. The makers are Cook & McLane, 81 Center Street, New York.

### Serewless Door Knobs and Spindles.

Figs. 3 and 4 of our illustrations show the Peacock patent screwless door knobs and spindles, now being introduced by the Yale & Towne Mfg. Co., of Stamford, Conn. Every one who has fitted up doors with ordinary trimmings knows their defects and the annoyances caused by their employment. Objections to the side screws, which are the almost universal means of fastening the knob to the spindle, and the use of loose washers between the knob and its rose or socket, in order to adapt the trimmings to the thickness of the door, are universally recognized. There are very few buildings in which knobs do not occasionally come off on account of the screws by which they are attached to the spindles working loose and falling out. Any improvement which has for its object the construction of knobs and spindles in such a manner as to overcome these difficulties is of great importance to builders. The method employed in the construction here illustrated is at once simple and effective. The spindle consists of a solid piece of metal, one end of which is shown full size in Fig. 4 of the engravings, square in its central portion and made to fit the hub of the lock. Each of its ends is formed into an eccentric, while the socket of the knob has a corresponding shape. Accordingly, a complete set consists of three pieces, namely, the two knobs and the spindle, all as shown in Fig. 3. No screws or washers are required. The spindle is passed through the lock, extending an equal distance beyond each side of the door in the usual manner. The knobs are then slipped endwise on to it, which may be freely done when the eccentrics on the spindle and in the knob shanks are made to coincide. The knobs are fastened in position, after being placed as described, by simply grasping one in each hand and turning in opposite directions. Each spindle has an adjustment of 1½ inches, and, as will be seen by the above description of the method of handling them, the knobs when applied are adjusted instantly to the exact thickness of the door, whatever it may be. The pitch or grade of the eccentrics causes an enormous pressure to be exerted, which results in the rigid engagement of the three pieces, the spindles and knobs becoming virtually one piece. The special advantages to which the manufacturers direct attention are the rigidity of the trimmings applied in this manner, the economy in labor in putting them in place, as they are more quickly applied than any others, and their permanency. Once properly fixed, the knobs will always remain in order, there being no screws to fall out and no adjusting washers to get loose. The knobs may be removed from the door in case of alteration almost as quickly as applied, and yet there is no danger of their being turned off in ordinary use. These goods have been in use to a greater or less extent

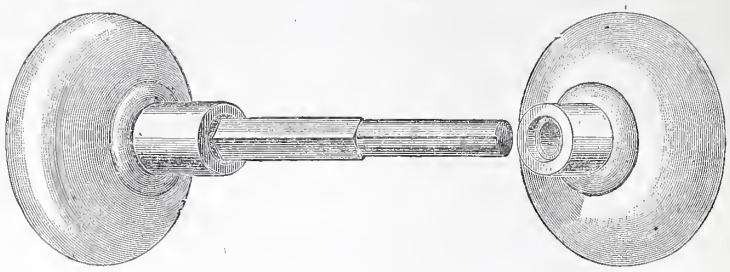


*Fig. 3.—General View of the Peacock Screwless Knob and Spindle, Half Full Size.*

*Fig. 4.—Full-Size View of End of Spindle and Section Through Socket in Knob.*

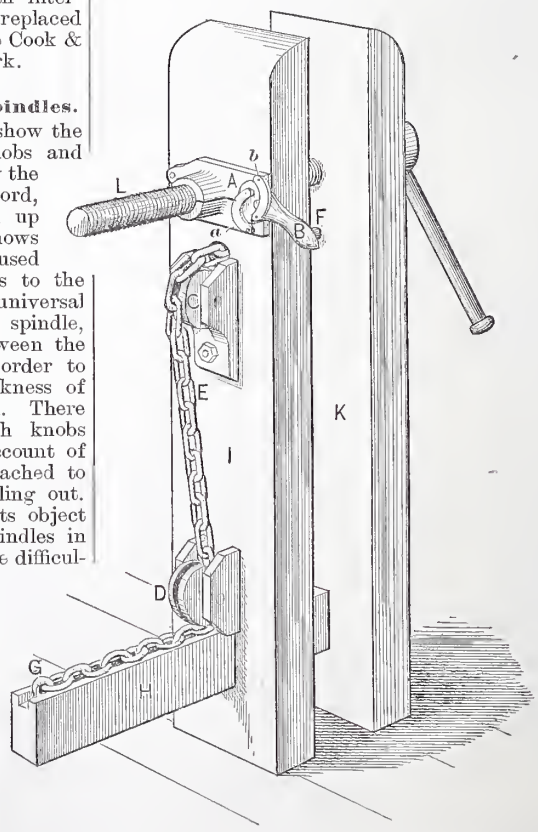
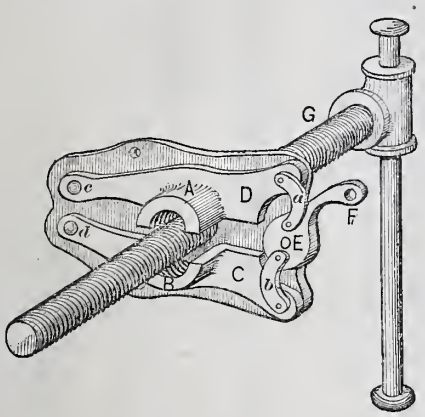



*Fig. 5.—General View of the Reno Vise from the Back.*

during the past four years, for the most part in the West, and, after having gone through the experimental stage, they are now being manufactured largely for the trade.

### Improved Bench Vise.

The Reno Bench Vise Co., of Detroit, Mich., are introducing an improvement in bench vises, the general features of which are shown in Figs. 5 and 6 of the engravings. The vise as constructed by them is essentially a parallel vise in its operation, the top and bottom working simultaneously. At the same time the arrangement of parts is




*Novelties.—Fig. 6.—Detail of the Screw and Open Nut Through which it Passes.*

such that it may be quickly moved in adjusting to any required space. How this is accomplished is more clearly shown in Fig. 6. It will be seen that the nut through which the vise screw passes is made in halves, and is opened at will by an eccentric with a handle, F. In practice, when it is necessary to open the vise a considerable space, instead of turning the screw, as would be done with vises of ordinary construction, the handle F is raised, when the front jaw is pulled out bodily to about the space required. The handle is then lowered, closing the nut upon the screw, when the jaw is further adjusted to the exact distance required in the usual manner. The parallel motion of the vise is obtained by means of a chain, which, being attached to the forward member of the vise just below the screw, and passing over two pulleys, C and D, is permanently fastened to the lower gauge piece G. Hence, pulling against the top of the vise is equivalent, by the action of this chain, to pulling also at the bottom of it. In closing the vise the reverse of this is the case, and the lower portion can be easily closed by means of the foot.

## Wood Floors and Carpets.

That wood carpets, however handsomely designed, will in this country ever supersede the products of the loom is scarcely among the probabilities. But their adaptability to the sanitary rules which should govern the furnishing of all bedrooms, nurseries and the common sitting-rooms is without parallel. In the library, the music-room and the dining-room, wood carpets are by far preferable to those of the wool. The latter deadens the sound of any instrument and robs the singer of his finest tones; in the dining-room it holds the odor of the dinners served therein inextirpably; in the library, mustiness, and in bedroom and nursery absorbs all that is virulent in the air and the dregs of disease, if disease there be. The wood carpet, being compact, excludes the penetration of, and forces upward, all foul gases, which must then naturally find an out let through other sources. The designs are so numerous and beautiful that almost any taste may be satisfied, and even the plainest looks well with the addition of a few bright-colored, well-chosen rugs and mats by way of relief.

Plate glass was discovered in an accidental way in 1688 by a man named Thevart. It is attributed to the breakage of a utensil containing some of the melted material, a portion of which flowed under a large flagstone, which, when subsequently removed, was found to cover a plate of glass. Thus was suggested the idea of casting glass in plates.

## Curious Properties of the Figure Nine.

This subject was considered by our correspondents some time since, and many peculiarities of the figure 9 were cited. The following, however, contains some facts not previously noted in our columns:

Any multiple of 9 consists of figures which, when added together, make 9 or a multiple of 9.

EXAMPLE.

| | |
|---|---|
| $9 \times 2 = 18$ | 8 and 1 are 9 |
| $9 \times 3 = 27$ | 7 and 2 are 9 |
| $9 \times 4 = 36$ | 6 and 3 are 9 |
| $9 \times 5 = 45$ | 5 and 4 are 9 |

If any number of figures be written down and then transposed, the difference between the two resulting numbers will always be a multiple of 9 (divisible by 9 without a remainder).

EXAMPLE.

| | | | | |
|---|---|---|---|---|
| 864 | 864 | 864 | 864 | 864 |
| 846 | 684 | 648 | 486 | 468 |
| 18 | 180 | 216 | 378 | 396 |

This property of numbers is extremely valuable to bookkeepers. If any footing of a column of figures is transposed in carrying forward, it will be indicated at once in making the trial balance, and a vast amount of labor saved thereby.

To give the result of a sum before the figures composing it are set down: Ask any one to write down a number consisting of two or more figures. For example 42

Then write privately upon another piece of paper the figures made by taking away 2 from that number and placing it in front (240).

Now tell him to set down two more figures of his own choosing under the first two, say..... 65

and write beneath them the two figures necessary to make their value equal to two 9s, or 99. In the present instance these would be..... 34

Repeat this operation. Thus, if he set down..... 84

you must set down..... 15

Now tell him to add up the column and the result must inevitably be 240, or the number you had privately written down..... 240

This may be done with a line of any number of figures, but we would not recommend the use of more than two or three as the initial number.

To square any number of 9s—that is, to multiply together 99 by 99 or 999, &c.- you have only to write down as many 9s less one as you wish to multiply, then one 8, as many ciphers as 9s and the figure 1. Thus:

$$99 \times 99 = 9801$$
$$999 \times 999 = 998001$$
$$9999 \times 9999 = 99980001, \text{ &c.}$$

To tell the difference between the ages of two persons without knowing that of either: Tell one of them to subtract the age of the younger from 99, to add that of the elder and tell you the result. You then cancel the first figure, adding it to the rest, and the result will be the difference sought.

*Example.*—Let the ages be 43 and 27. From 99 subtract 27, leaving 72, to which add 43, giving 115. Cancel the first figure (1), adding it to the rest, and you have 16, the difference sought.

To discover any number thought of, without asking for other than an approximate answer: Let any one select a number mentally, or write it down unknown to you. We will suppose, as an illustration, that he selects the figure 7. Tell him to treble it, and ask if the result be odd or even. The result being 21 ($7 \times 3 = 21$), he will tell you it is odd. You therefore set aside 1. Tell him to add 1 to make it even and halve it ($21 + 1 = 22$; the half will be 11). Tell him to treble it again and to tell you if the result be odd or even ($11 \times 3 = 33$. It being odd this second time, you set aside 2. Let him again add 1 to make it even, and halve it ($33 + 1 = 34$; the half will be 17). You now ask him how many times 9 will go into that half, regardless of the remainder. He will tell you 1. Each time that 9 will go into that half must be considered as equivalent to 4, to which you simply add the 1 and the 2 previously set aside by you ($4 + 1 + 2 = 7$) and announce to him that the number he chose privately was 7. In case the result of the multiplying by 3 should be an even number each time, you have, of course, nothing to set aside. A few examples will show the different operations very clearly.

| | | | |
|---|---|---|---|
| 1 | | 3 | |
| 3 | | 3 | |
| 3 | (Odd=1) | 9 | (Odd=1) |
| Add 1 | | Add 1 | |
| 2)4 | | 2)10 | |
| 2 | | 5 | |
| 3 | | 3 | |
| 2)6 | (Even=0) | 15 | (Odd=2) |
| | | Add 1 | |
| 9)3(0 | (=0) | 2)16 | |
| Sum 1 | | 9)8( | (o=0) |
| | | | Sum 3 |

| | |
|---|---|
| 43 | |
| 3 | |
| 129 | (Odd = 1) |
| Add 1 | |
| 2)130 | |
| 65 | |
| 3 | |
| 195 | (Odd = 2) |
| Add 1 | |
| 2)196 | |
| 9) 98 | (10 (= 40) |
| | Sum 43 |

To so arrange the figures from 1 to 9 that they will, when added together, give 100.

| First method. | Second method. |
|---|---|
| 1 | 15 |
| 3 | 36 |
| 5 | 47 |
| 8 | — |
| 9 | 98 |
| — | 2 |
| 26 | — |
| 74 | 100 |
| 100 | |

To find the number expunged from an unseen line of figures:

Let any one write down a row of figures; say..... 32,457

and after adding them together as units ($3 + 2 + 4 + 5 + 7$)..... 21

place the sum beneath and subtract it..... 32,436

Ask him to strike out any figure in the remainder and tell you what is left. You add these figures together and subtract their sum from the next highest multiple of 9 and that will give you the figure canceled.

For example: If from the above remainder 32,436 he strikes out 2, 3436 will remain, and $3 + 4 + 3 + 6 = 16$; 2 are therefore wanting to complete 18, which is the nearest multiple of 9.

If 6 should be canceled, 3243 (= 12) will remain and 6 are wanting to complete 18 as before.

## New York's Great Growth.

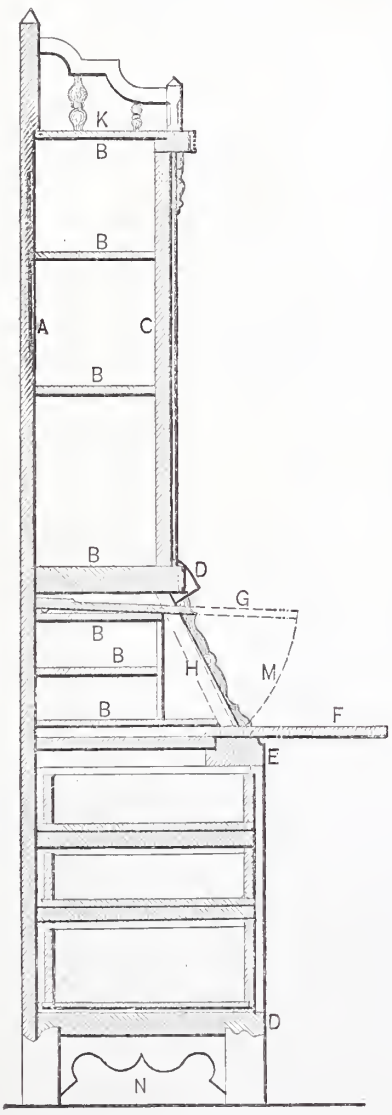
The material prosperity of New York is shown to a great degree in the increased building which is perceptible all over the island, especially in the upper end. In business marts mammoth structures are being reared, while the Cotton and Produce Exchanges are providing for buildings which cannot be equaled in the world of trade. During the first six months of the present year the amount expended in new buildings exceeds the same period last year by $3,883,-

495. The official report of the Building Department for the quarter ending June 30 is as follows:

| Class of buildings. | Nos. | Cost |
|---|---|---|
| First-class dwellings | 116 | $3,939,000 |
| Second-class dwellings | 12 | 97,400 |
| French and English flats | 98 | 6,454,000 |
| Hotels | 4 | 378,000 |
| Tenements and stores | 79 | 1,482,000 |
| First-class stores | 20 | 1,761,000 |
| Second-class stores | 13 | 80,200 |
| Third-class stores | 21 | 114,355 |
| Tenements | 132 | 2,057,500 |
| Offices | 10 | 337,900 |
| Churches | 2 | 80,000 |
| Factories | 12 | 386,000 |
| Schools and colleges | 2 | 284,000 |
| Public buildings | 8 | 588,000 |
| Stables | 25 | 168,325 |
| Workshops | 7 | 43,500 |
| Frame buildings | 56 | 262,690 |
| Total | 1,148 | $18,508,970 |

This is an increase over last year of 517 buildings, and an enhanced valuation of $5,225,170. For the first six months the total number of buildings erected, or in course of erection, numbers 1779, at a cost for construction of $31,782,800.

We are inclined to think that no greater proof is needed that a work is too big for its engineer than the excuse which is frequently made after completion that the thing was experimental, and hence it was not to be wondered at that mistakes were made. At the coroners' inquest upon the Brooklyn Bridge disaster, one of the leading trustees made remarks to the effect that, if in the beginning they had known as much as was known then, the bridge would in many ways have had a greater capacity. The excuse given is, of course, that the thing was to a certain extent experimental, and there were some things that could not have been foreseen. We see no reason why the crowds which cross the bridge could not have been foreseen by counting the passengers on a Fulton ferry-boat, or, what is better yet, the number of people who during the one-cent hours pass down Beekman and Fulton streets at a point as high up as Nassau. The number of this crowd could be easily checked by ascertaining the number of persons who walk away from the Fulton ferry-house in Brooklyn. The figures thus obtained would certainly have prevented some of the mistakes which have been made. That they were not obtained is creditable neither to the bridge trustees nor to the engineers.



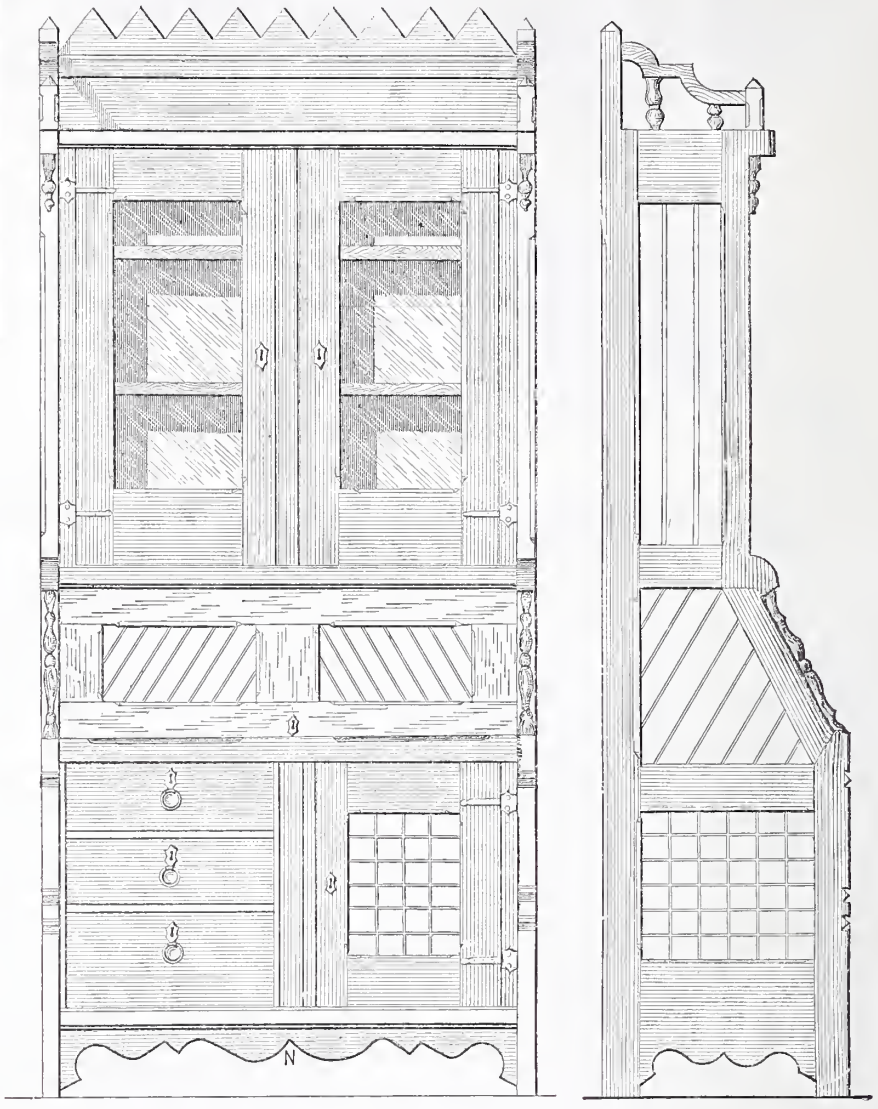

*Design for Secretary and Book-Case.—Fig. 1.—Vertical Cross Section.*

On the day of the Brooklyn Bridge opening we had occasion to take a large party of ladies and gentlemen on to the roof of a very lofty Brooklyn manufactory. In going up it was remarked that the stairs were somewhat steep, but afterward it was called to mind as a curious and remarkable fact that when the fifth or sixth floor was reached nobody was out of breath or fatigued. In fact, the stairs had not been noticed. The secret of the easy ascent was found in the low risers. Although each flight was lofty and there were many of them, the work was done in such a way as to produce a minimum fatigue. This is a subject frequently talked about by architects and builders, but very little is done in a practical way, and when it is suggested to take off an inch or half-inch from the risers, a good and valid objection is usually found in the pitch of the staircase, or some other excuse which enables the one in charge to plan the stairs according to fashion, and make the last built staircase as difficult of ascent as staircases in general. In factories the importance of ease of ascent is usually overlooked and other considerations made to control. This is not as it should be, since ease of communication is very important and ought to receive much more attention than it does.

## CORRESPONDENCE.

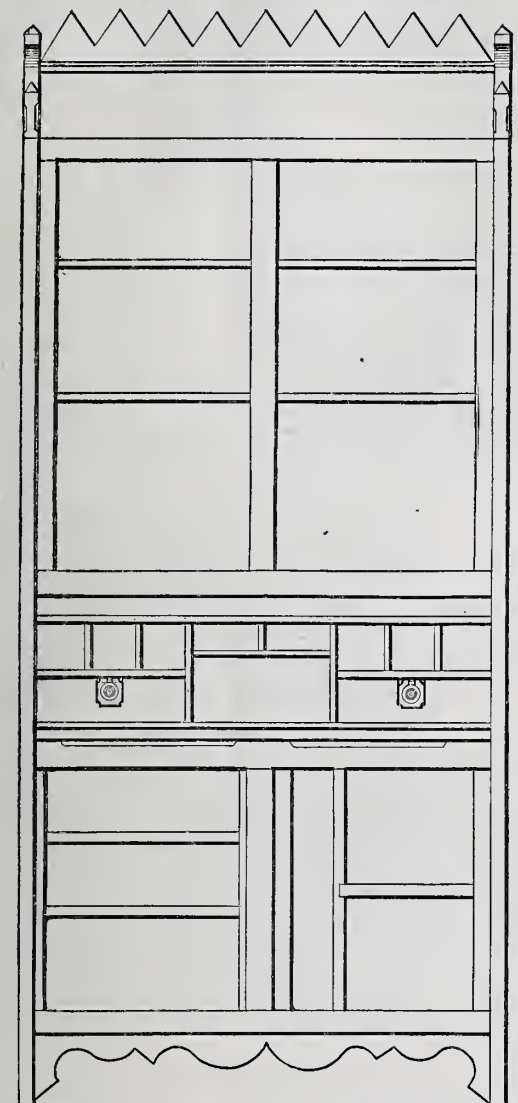
### Design for Secretary and Book-Case.

*From* C. S., *Caldwell's Prairie, Wis.*—The secretary and book-case shown in the accompanying engravings is intended to be built of walnut and ash. The drawings are ¾ inch to the foot. The sides are to be framed together and made from plank 1½ inches thick, with panels of narrow beaded stuff sunk ½ inch from the face. The lower panel shown in checks is to be made of narrow stuff like those above mentioned, but instead of beading, the edges are to be worked off so as to form a V-shaped groove at the joint, and is then crossed with like grooves. The doors of the upper part are to be of glass; if preferred, the panels of doors and sides may be decorated with art tiles. Fig. 1 shows a section of side; A is the back, of ½-inch stuff placed under ⅞-inch muntins. B B are shelves, those in the upper portion being movable, having saw-edged strips fastened to each corner to support a cross-piece on which the shelves rest. C are the doors, placed ½ inch back from face of frame. D represents the rails separating the different parts, which are 1½ inches thick, with beaded or irregular cut face, while the rail at E is 2 inches thick and is simply chamfered on the upper corner. F shows the writing table drawn out, and also the pocket into which it slides when not in use. G shows the door over pigeon-holes raised and slid back into its pocket, the dotted lines showing how it works. A piece of half-oval iron is screwed to the back upper edge of this door, and the ends project ¼ inch at each end and play into grooves cut into the sides, thus preventing the door from being pulled completely out. The front post of railing is made 1½ inches square, with chamfered corners. K are spindles or turned posts 1 inch in diameter. The orna-




*Figs. 2 and 3.—Front and End Elevations.—Scale, ¾ Inch to the Foot.*

ments at L and M are also turned 1½ inches in diameter and then split with a very thin saw, making two ornaments from each piece. The ornaments at N are ⅞ inch thick. Fig. 4 shows the front with doors and drawer removed so that the interior arrangement may be seen. The upper shelves have a depth of 10½ inches, while the total depth of the upper part is 13 inches. The lower part is 20 inches. The width of the upper shelf D′ is 15 inches from back to front, making a projection of 2 inches over the drop L. I think that any competent workman will have no difficulty in building from this description.



*Design for Secretary and Book-Case.—Fig. 4.—Interior Arrangement.*

### Drawing Parallel Lines.

*From* M., *Colorado.*—Please inform me, through the correspondence department of *Carpentry and Building*, where I can get a T-square with an arrangement in the stock for drawing parallel lines close and even.

*Answer.*—There are two devices of this general description prominently in the market. One of them, manufactured by Daniel T. Ames, 205 Broadway, New York, we noticed among our "Novelties" some time since. The other, made by William Gardam & Sons, 96 John street, New York, has a capacity for still other work besides that described by our correspondent, and will appear among our "Novelties" in a short time. We think either of them will answer his purpose.

### Benzine Tar and Tin.

*From* W. L. W., *West Shore, N. J.*—Is the tar that comes from gas made of benzine injurious to tin or iron roofs? I saw in *Carpentry and Building* that tar is injurious, but do not know whether the benzine tar is or is not.

*Answer.*—We think this tar would in all probability be just as injurious to tin as that made from ordinary coal. There seems to be no essential difference between the two substances, so far as we can learn.

### Plated Screws.

*From* A. H. F., *Meriden, Conn.*—Responding to an inquiry from a correspondent, published in a recent issue, I would say that plated screws of various kinds are supplied by C. Rogers & Bros., Meriden, Conn., with whom it may be to the advantage of the inquirer to correspond.

### Framing Hip Roofs.

*From* G. W., *Wauseon, Ohio.*—I have been reading your paper for two years, and I have seen several designs for framing hip roofs, but none that I considered quite as good as the plan I have been using for the last 25 years. I find it practicable in all hip roofs, and hip and valley and octagons, equal or unequal pitch in same roof. I have framed a great many roofs of equal pitch—*i. e.*, all sides same pitch—also many where main roof rises 9 feet in 8 feet, and front and rear gable rising 9 feet in 5 feet, and find the length and bevels of the jacks all fit exactly; consequently, I conclude it is just as easy to draft and frame any roof as it is to frame a simple gable roof, and no more need of making a mistake. As I think it may be of benefit to young carpenters who wish to understand the business of correctly framing all kinds of roofs, I will give you a sketch of my plan of working—not my invention, for I found it in Smith's "Architect."

Fig. 1. On the plan 1, 1, 1, 1, 1 represents the outside of the plate; 2, 2, the ridge line; 3, 3, 3, 3, 3, 3, the jack rafters of hip and valley; 4, 4, the side bevel of jacks and the length of jack from corner of plate and ridge to side of hip and valley; 5, bevel at head of hip and valley; 6, bevel at foot of hip and valley rafter; 7 is a common rafter; 8, the bevel at head of common rafter, is the down bevel for all jacks on hips and valleys; 9, 9 is the length of hip and valley rafter; 10 is the method of getting the bevel of back of hip. Draw a line at right angles with base line of hip, then set one foot of the dividers where this line crosses the base line, and the other where it crosses the hip-rafter line, and set the same distance on the base line, and draw lines from that point to the plate each way, which gives the bevel for hip, and, turned the other way up, it gives the hollow for the back of the valley. Line from *a* to *b* is the length of hip and valley, dropped down to get the length of jacks. Lengths and bevels of all hips and valleys the same in same roof of same pitch.

Fig. 2 is a plan for framing a valley in a roof where one side is much steeper than the other, as, for instance, one side rises, say, 10 feet in 8 feet, and the other rises 10 feet in 4 feet. 1, 1 is the wall line; 2, 2 is the ridge line; 3 is the valley rafter; 4 is the bevel at the foot; 5 is the bevel at the head; 6 is the bevel of the jacks on the lowest pitch, also the length of same; 7 is the bevel of and length of jacks on the steep side; 8 is the common rafter on steep side; 9 is common rafter on the lower pitch; 10 is the down bevels on jacks of each side; 11 is the height of roof; 12, the base line of valley. The rafters will not match on the valley as on an equal-pitch roof, as Fig. 1. It will be seen that it will take seven jacks on the steep side, while it requires only four on the other side, but the bevels will all fit, as I have framed similar roofs, and find no trouble in putting it up.

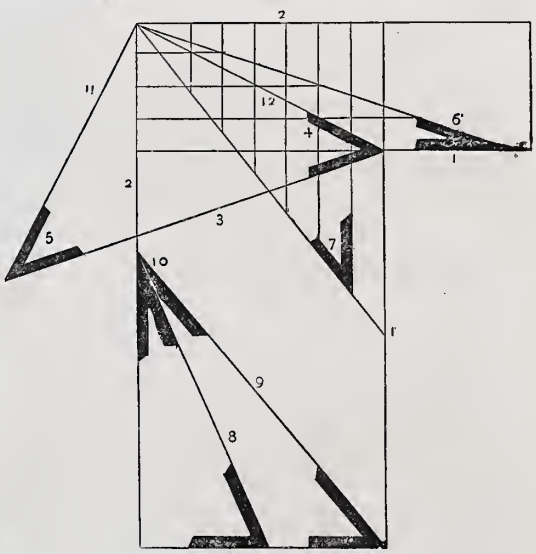
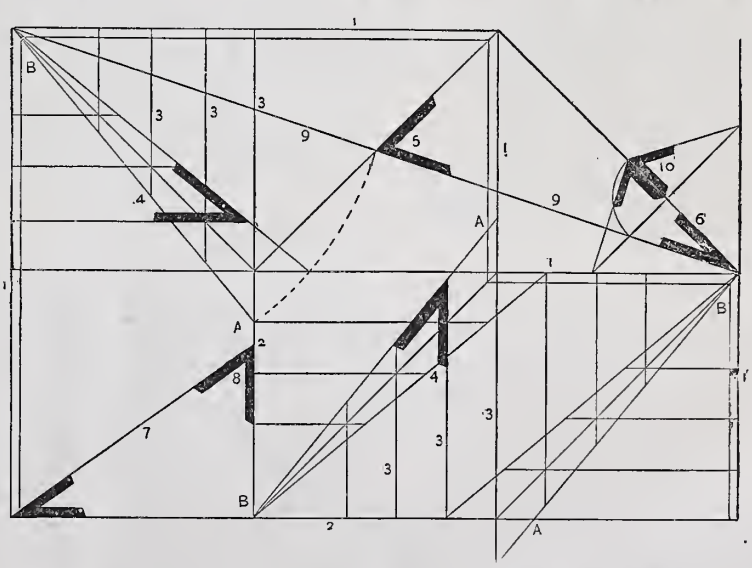


*Fig. 2.—A Valley Between Slopes of Unequal Pitches.*

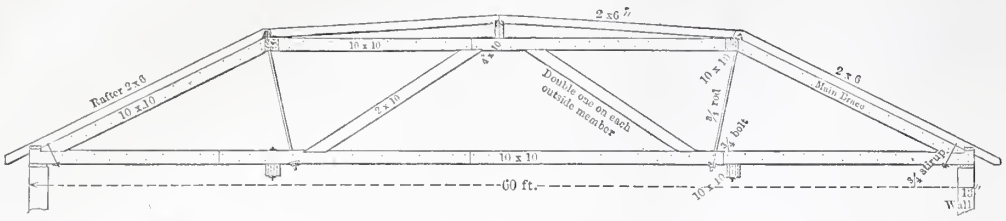
### Shingling Valleys.

*From* J. C. E., *Montreal, Canada.*—I notice in a recent issue of *Carpentry and Building* an inquiry with regard to shingling valleys. My way is to cut zinc into pieces about 7 x 9 inches, and to lay them in on each course as the work progresses. I bring the shingles tight together in the angle, so as to cover the zinc completely. I pursue a similar



*Framing Hip Roofs.—Fig. 1.—The Cuts for Hip, Valley and Jack Rafters.*

course at the sides of dormers. A metal flashing is cut and laid in with each course, allowing about 2 inches to turn up at the side. I have followed this plan of construction for a long time, and am prepared to guarantee that work properly fitted in this manner will not leak.




*Framing a Mill Roof.—Fig. 1.—Elevation of Transverse Girder.—Scale, $\frac{1}{12}$ Inch to the Foot.*

### Framing a Mill Roof.

*From* C. S., *Adams, Ohio.*—I inclose a sketch of a mill roof recently built in this vicinity. The building which it covers is 60 x 80 feet, two stories high. The roof is quarter pitch, hipped, and has a deck about 28 x 50 feet. The transverse and longitudinal girders, main braces and compression beams are composed of 2 x 10 hemlock joists

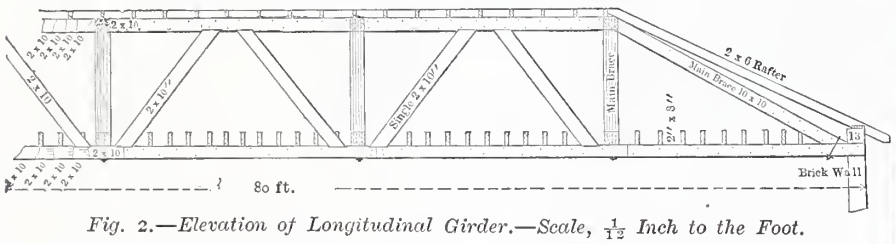
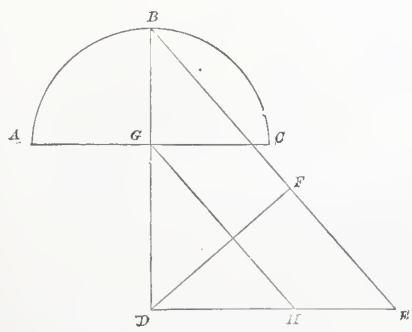



*Fig. 2.—Elevation of Longitudinal Girder.—Scale, $\frac{1}{12}$ Inch to the Foot.*

16 feet long, spiked together with cut spikes. There are five of these pieces spiked side by side with butt joints, making the timbers 10 x 10 inches in section in each of the four transverse trusses. There are five butt joints within 8 feet of the center of span, and the average is but 4 feet; 2 x 8 joists rest on these girders, intended for a third floor. The roof is in true line, and one of the owners of the building has said that it would stand the weight of snow 10 feet deep. The writer of this, however, does not work under the roof described. The building is a planing mill, containing a lot of heavy machinery running at high speed. The mystery of the construction is that the roof stands at all.

### Shape of Awning for Circle-Headed Windows.

*From* G. F. D., *Waterloo, N. Y.*—In the number of *Carpentry and Building* for March, 1882, H. L., of Cincinnati, inquired for a




*Awning for Circle-Headed Windows.—Fig. 1.—The Problem Presented.*

method for finding the shape of an awning for a circle-headed window. In the accompanying diagrams I present a rule which I think will be of service to him. In Fig. 1, let A B C be the circle of the given window; B D the distance down which the awning is to stand, and D E the projection of the awning. Draw G H parallel to B E and D F at right angles to B E. In Fig. 2 make the triangle B D E equal to the triangle indicated by similar letters in Fig. 1. Produce B E indefinitely in the direction of M N. Draw G H T and D U parallel with B E. Draw M P N perpendicular to B E produced, and lay off P R and P T equal to the radius of the circle of the window head. Draw S R and U T parallel with M P N. Construct the semi-ellipse R N T, using R P T as the major axis and P N as half of the minor axis; then S R N T will represent the section of a solid cut by two planes at right angles to each other, or, in other words, it will represent the outline of the required awning on the line D F of Fig. 1. The development of the surface included between the planes, as shown in Fig. 2, will be the shape of the pattern of the awning. Divide the distance S R N into equal parts. From the points of division draw lines parallel to B E through the triangle B D E, cutting D B and D E. In Fig. 3 draw the line D F D, which in length make equal to twice the spaces laid off in S R N. Through points in D F D thus established draw lines at right angles to it, numbering them to correspond with the lines drawn from the profile S R N, through the triangle B D E. Measuring from D F D, on the lines drawn through it, lay off the distances 1 1′, 2 2′, &c., as measured in the triangle B D E, Fig. 2. Through the points thus found draw the curved lines of Fig. 3, which will bound the required pattern. In conclusion, I would suggest that if this rule be deemed too long for practical use, the correspondent who inquired can continue to guess at it.

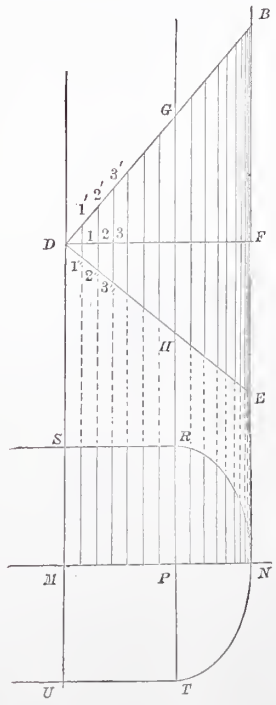



*Fig. 2.—Obtaining the Section, &c.*

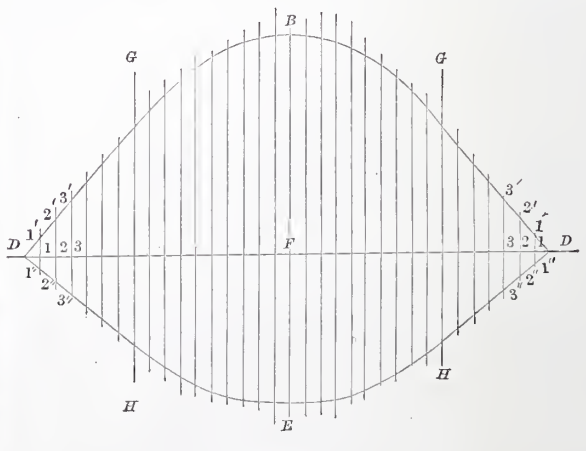



*Fig. 3.—Developing the Shape.*

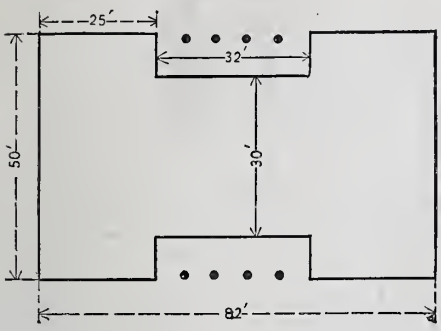
### Choice of Form in the Design of Buildings.

*From* E. G. Aurand, *Ossian, Iowa.*—If it is not asking too much, I desire to make a few comments on the "First Prize Design" in the June number of *Carpentry and Building*, and more particularly on the subject of planning and designing buildings generally, from the standpoint of one who has been engaged more than 30 years in the practical construction of buildings, as well as their design. I am aware the subject is too extensive to be more than noticed in a communication like this, and the little I shall write will be principally in the form of questions and suggestions. As an example of the prevailing style of domestic architecture, I like the "First Prize Brick Design." I believe a roof like the design shown in the August number of *Carpentry and Building* for 1882 would be less expensive, but probably not as pleasing to many persons. My first question, however, is presented on viewing the design of piazza cornice. Would not various other forms be more appropriate for a perforated piazza frieze than Gothic arches and columns many times repeated and hung up in mid-air on a strip of wood? It seems to me the designer made a mistake of position, and put his balustrade railing in the frieze and his frieze design in the balustrade. Are we not only liable to cultivate a spirit of irreverence and disrespect for art, but even cripple our capabilities for perfection in design, by employing the primary constructive features of any style for merely ornamental purposes? I suppose it is the habit with designers of buildings to borrow and lend in the study of design until a certain characteristic form, finish or style of building becomes all the fashion. I perceive the fan-like design prevails in the spandrels of arches, panels, &c., in nearly all work of the present, and it is a very agreeable ornament, but is it not likely that the habitual use of this detail in excess will sooner or later bring a reaction, and consequent distaste for a really good thing?

Another detail as used now quite frequently, I think deserves a question, and that is designing columns for architectural work, either large or small, turned or square pattern, with the large or base end upward. I know there are those who contend that, since it is construction for support, the design may have the larger end upward with equal propriety, and for comparative proof refer to the limbs of animals and of man. I am inclined to see the analogy differently. The limbs of animals carry a moving, elastic weight, while in the vegetable type Nature gives us the tree, which, being moved upon by the shock of storms, has its largest cross-section at the base. The spokes of a wheel are largest at the hub, and correctly so, to resist the strains of a moving load. A building, to be stable and permanent, must be strongest at the base. Now, if the building appears more satisfactory with a broad, strong and substantial base, may we not infer that if the subordinate parts are de-

signed with reference to this appearance of stability, it is a better principle of design?

Three geometrical figures—the triangle, square and circle—are the chief forms used for the plans and boundary lines of buildings. Omitting the circle, I suppose all students of architecture are willing to agree upon the square form as most economical for the general plans of buildings. Appropriate, and having relation to this subject, was a notice in the June number of *Carpentry and Building* of a double cross, or blunt-pointed, stellar form of plan, copyrighted for school houses. As the description given was without accompanying diagrams, perhaps criticism would be prejudicial to the design, but if I may be pardoned for referring to a case where I was called in consultation on a design for a schoolhouse, I may be able to show the disadvantage of irregular and many-angled forms by an actual case. Several plans having been submitted for inspection, the chairman of the board sketched a plan of a schoolhouse that he admired, which had been built in the State of New York. He thought it a better plan than any submitted. Fig. 1 is an outline of this plan. The school board were unanimous in their desire for economy in the construction of the building, which was limited in cost to $17,000. I ventured to suggest to the chairman a more economical arrangement of his plan by turning the recessed central walls in Fig. 1 outward, as in Fig. 2, thus providing over one-third more space to each floor, with the same measurement of exterior wall and with but small additional roofing, when the porch roofs of his plan were considered. The floor space in Fig. 1 is 3460 feet. The




*Choice of Form in the Design of Buildings.—Fig. 1.—Outline of Plan of Proposed Schoolhouse.*

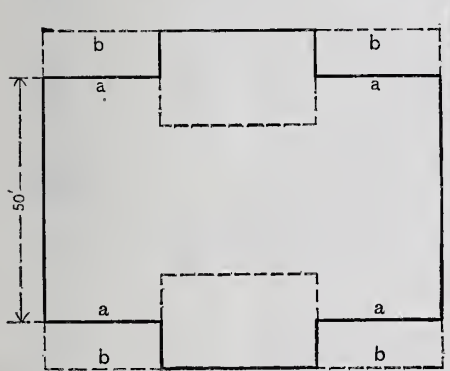



*Fig. 2.—A Change Obtaining Larger Floor Space with the Same Walls.*

change as noted in Fig. 2 gives 1280 feet additional, or over one-third. By further rotating the walls marked *a* to the position of the dotted lines *b*, 1000 feet more are added to the floor space with the same length of wall.

My desire for introducing this individual instance is to illustrate the advantage of the simple and most direct forms over opposite ones for economy in construction and design. Broken up and circuitous lines, with many projections and re-entering angles, must increase the boundary walls, and at a sacrifice of space. So with sharp-pointed roofs, unless the space afforded is desirable. The French are the best architects, or generally so acknowledged. Their mansard roofs are chord lines of a circle or other curvilinear line, and the shortest to cover the inclosure. It has been urged against the square and regular forms for the plans of buildings that they do not admit of the same artistic treatment, or with equal effect, found in the design of irregular plans. Objectors advance the idea that irregular plans furnish the necessary wall surface for the play of light and shade, and the various shaped roofs and gables and irregular sky lines insisted upon as a requisite of beauty. I beg to differ with this view, and if this article was not already longer than intended in its beginning, I would present reasons for the difference.

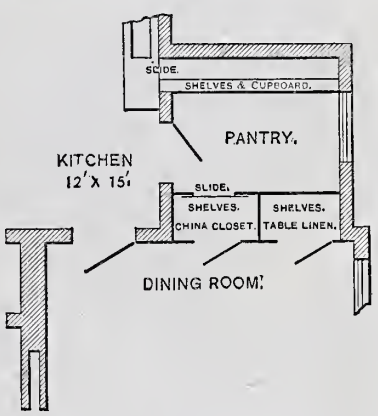
As it is by the courtesy of the Editor that the subscribers to *Carpentry and Building* get a voice in its columns, if the Editor does not object, I will present my reasons at another time.

### Determining the Hight of Ridge Board of Pediment.

*From* E. M. C., *Youngstown, Ind.*—I will endeavor to tell H. E. G., of Plainfield, N. J., who inquires how to determine the hight of ridge-board of pediment. Suppose the building is 16 feet wide and the roof 7 feet pitch—the length of the rafter will be 10 feet 7½ inches. Say the pitch of the pediment roof is 5 feet—that is, 5-7ths of the main roof. Commence at the foot of the main rafter and measure 5-7ths of the way up, which in the example given would be 91 1-14th inches. Make a mark at this point and tack the ridge-board to the mark.

### Criticism on "Photo's" Plans.

*From* J. M., *Belmont, Wis.*—The floor plans submitted by "Photo," and which are published in the June issue of *Carpentry and Building*, although essentially an eight-room house, and therefore out of the seven-room competition, come nearer to my ideal of a model rural home than any of the prize plans. It has, however, the inevitable passage through the pantry from the kitchen to the dining-room. Such an arrangement may be all right in theory, but in practice in cheap houses it is generally an utter failure. I inclose a sketch of an arrangement much liked in this section of the country, which I think is preferable for this class of houses.

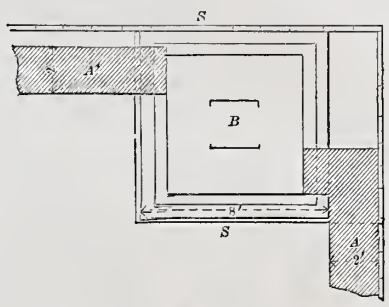



*Criticism on Photo's Plans, by J. M.*

### Deep Excavation Near an Elevated Railroad Column Foundation.

*From* RAE, *New York.*—When building some vaults beneath the sidewalk along the line of the elevated railroad, I found it necessary to go below the bottom of the foundations of the columns of the railroad, which had to be done without disturbing the foundation, because if that were done it would be necessary to rebuild it, causing an outlay of about $500. The railroad company had scaffolding which it erected to support the superstructure and take the load off the pier while we were working under it, so we had only the foundation of the column to take care of. The soil was a fine sand, heavily saturated, which flowed freely with the water, and the problem was to dig down to the required depth and leave only the prism of earth under the column foundation. It was noticed that when the earth was not saturated it was quite firm and stood very well, and that in contact with water it seemed to crumble rapidly—similar to soft sugar dissolving in water.

The sketch Fig. 1 will give an idea of the task. The vault wall A was to be built around the pier B supporting the elevated railroad column, and was to extend down about 4 feet below the bottom of the pier. Tongued and grooved sheet piling, S, was driven along the outside boundary at A, and also around the pier B to the depth of at least a foot below the lowest point to which the excavation was to be made. This was done to stop the flow of water, which was from S toward A, and prevent it from flowing through the earth under B. The earth




*Deep Excavation.—Fig. 1.—Plan View.*

was then excavated in the vault to the required depth, the water which flowed in being pumped constantly until the work was finished, and then the bottom was covered with a layer of concrete. The wall A was then commenced, and also a wall around B, which was built with a batter, and was to serve as a retaining wall to support the prism of earth under B, which had to carry the load of the foundation, column and superstructure of the elevated road.

Fig. 2 serves to show its construction. When this retaining wall was built to within a few inches of the bottom of the pier, the sheeting behind it was pulled out and grout poured in back of the wall to fill any cavities which might have formed, and then the wall was built up with the regular batter until it died out in the brickwork of the foundation into which it was built. The sheeting around B had been perfectly successful in preventing the flow of water through the earth under B, and when the work was finished,

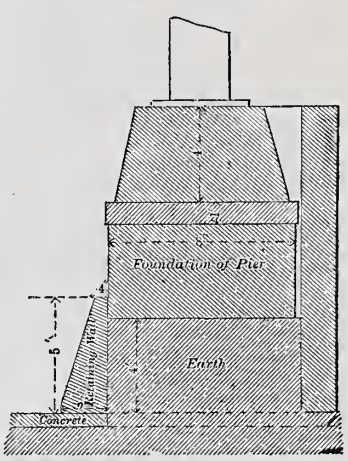



*Fig. 2.—Section of Foundation.*

levels taken on the foundation showed there had been no appreciable settlement. Keeping the water out of the mass had given it the necessary stability to stand while the work was done.

## TRADE PUBLICATIONS.

### Saylor's Portland Cement.

Messrs. Johnson & Wilson, general sales agents for Saylor's American Portland cement, with office at 91 Liberty street, New York, have issued a neat pamphlet descriptive of the merits of this article. A very striking title in red, blue and black, embracing the trade-mark of the company, appears on the first page of the cover. Illustrations within the pamphlet are views of the works

of the establishment and the packing warehouse. Then follows a brief essay on cement, with statistics of the amount entered yearly at the port of New York since 1877. Directions for use and mixing for sidewalks, cellar floors, stable floors, and other purposes, together with a list of work for which Portland cement is best adapted, succeed this. Then is inserted extracts from the history of the jetties at the mouth of the Mississippi River, by E. L. Corthell, published in 1880. This contains an illustration showing a birdseye view of the Port Eads jetties, with the requirements of cement work adapted to that purpose. Then follow tests which were made showing that Saylor's Portland cement gave satisfactory results. The balance of the pamphlet is largely devoted to testimonials from those who have employed the cement in large quantities, among which may be mentioned a letter from Mr. C. C. Martin, First Assistant Engineer of the New York and Brooklyn Bridge; Mr. D. C. Haskins, of the Hudson Tunnel and Construction Co.; Q. A. Gilmore of the United States Engineers, and Frederick Law Olmstead, landscape architect, United States Capitol. Following these are extracts from notes and experiments on the use and testing of Portland cement by Mr. William Maclay, member of the American Institute of Civil Engineers. Following these, extracts of still further testimonials are inserted. Altogether the pamphlet contains a large amount of information which is of importance to architects and engineers generally, as well as authentic testimonials which must go far toward indicating to any unprejudiced person the actual merit of the goods advertised.

### Ornamental Ironwork.

It has been customary for a long time for manufacturers of ornamental ironwork to get up very elaborate catalogues of thei productions. Catalogues are a necessity in their business, from the fact that many of their sales are made to parties living remote from the manufacturer, and, accordingly, a book of designs is a convenient means by which to make selections. Inasmuch as the work made in such establishmeuts is for the most part artistic in character, nothing less than a very elaborate book meets the demands of the case. Accordingly, some of the works which have been issued by enterprising manufacturers in this line are veritable art albums. It is hardly reasonable to expect manufacturers to send these books out gratuitously. Were they to interpose no obstacle in the way of their free circulation, very large numbers would be required to satisfy mere curiosity upon the part of those who never expect to become purchasers. Mr. J. W. Fiske, of Barclay street and Park Place, New York, has perhaps as complete a line of advertising matter of this kind as any house engaged in the trade. We have recently received a full set of his publications. They comprise a number of catalogues, each one showing goods in some particular department of his business, and each, we understand, is sent to any prospective buyer, architect or builder upon receipt of five cents in stamps for the payment of postage. Among the catalogues may be mentioned one of Vases, containing 18 pages measuring 20 x 28 inches in size. Auother of the same size page is devoted to Statuary, and contains handsome woodcuts relieved by black backgrounds, showing various pieces adopted for use both as decoratious upon buildings and for lawns and parks. A very large number of figures are contained in this catalogue, including some designs of candelabra and numerous animals. A third catalogue of the same size we have just described contains 24 pages and is devoted to Ornamental Lamp Columns and Brackets. Columns and lamps adapted for almost every imaginable purpose are shown, and cannot fail to be of interest to all who are investigating the subject. A fourth book of the same size is devoted to plain and ornamental Drinking Fountains, which, like the others, contains a great variety of designs. Among the smaller books issued by Mr. Fiske is a catalogue of upward of 120 pages, 11 x 14 in size, devoted to plain and ornamental Wire, Wrought and Cast-Iron Railings, Drive-way Gates, Window Guards, Door Guards, &c. Such a book in the library of every builder cannot fail to be of advantage for purposes of consultation. Another catalogue of the same size, containing some 30 pages, is devoted to Iron Crestings for French and mansard roofs, Bannerettes, Finials and Crosses. Still another pamphlet of the same size page is devoted to Aquaria and Ferneries. Among the smaller books issued by Mr. Fiske is one of 36 pages, devoted to fancy and plain Street Lamps; another of 80 pages is devoted to Weather Vanes, Emblematic Signs and the like; one of 36 pages is devoted to Settees, Chairs, Tables and Archways, and one of 80 pages is devoted to Iron Stable Fixtures. Much care has been displayed in the preparation of these catalogues, and just those particulars are given which every architect and builder requires to know in selecting goods for the finish of any building or the adornment of any piece of ground.

### Iron Fences, Railings, &c.

We have received from Messrs. Edwards, Clarke & Co., of Providence, R. I., a catalogue containing designs of wrought-iron feuces, railings, gates, roof crestings, &c., representing goods manufactured by them. This catalogue has the merit of containing original designs, most of which bear the imprint of one of the members of the firm. The designs are neat in their general character, and are well adapted to the uses for which they are intended. No prices accompany the designs in this pamphlet, it being manifestly impossible to give figures intelligently without knowing the quantity required and other necessary particulars. The roof crestings possess the merits of being light in their general features, neat in appearance, and of a construction adapting them to the places in which they are to be employed. The designs, unlike those in many catalogues that come before us, are original with the parties making them, and are not electrotype plates representing stock designs. Some handsome wrought and cast-iron balcony brackets are shown in the latter part of the book.

### Paper Doors.

In the use of wood for constructing doors, great difficulty is experienced from the shrinkage, swelliug and warping to which the material is subject, while the general use of metal for such purposes is rendered impracticable by its weight. To obviate these objections, a door composed of two or more sheets of paper-board, secured together and rendered homogeneous, has been devised. The following description is furnished by the *Manufacturer and Industrial Gazette:* Boards of properly prepared paper are taken, each having the requisite dimensions for a door, and a thickness of one-third or one-half the proposed thickness of such door, and within the outer board or boards, openings are cut that correspond in size, shape and location to the ordinary panel openings. The edges of these openings are preferably molded, but, if desired, may be left plain, and separate moldings may be secured thereon after the door is completed. The outer boards thus constructed are then coated upon their inner faces with a suitable adhesive mixture, preferably composed of 49 parts of glue and 1½ parts of bichromate of potash dissolved in water, and placed upon opposite sides of a central panel board, after which they are passed between rollers and subjected to a heavy pressure, which causes the boards to firmly adhere to and become practically homogeneous. The door may now be covered with any desired fire or water proof coating, and then painted in the ordinary way, after which it may be hung aud trimmed in the usual manner, and from the nature of the material employed is free from all changes which are produced by atmospheric causes upon wood, costs much less than metal, and has less weight even than a door constructed from pine.

The time allowed to architects competing for the new Exposition Building and Music Hall, at St. Louis, expired July 2. We learn that some 30 different designs have been submitted by as many different competitors, and the awarding committee are diligently at work to determine which, if any, of the plans is sufficiently satisfactory to be adopted as a whole, and which of the competitors is entitled to a premium. The building is to cost $500,000, and 10 premiums of $500 each are to be awarded to the authors of the 10 designs deemed most meritorious by the committee.

## STRAY CHIPS.

At Baltimore, Md., Mrs. Mary M. Wagner is putting up two dwellings on the north side of North avenue, east of Park avenue. Each house will he 24 x 64 feet in plan and three stories in hight. The material used in their construction will be brick, stone and terra-cotta. The estimated cost of the improvements is $15,000. Mr. Thomas Dixon, of that city, is the architect who prepared the plans and Mr. Lewis H. Robinson is the builder.

Mr. H. Doener is erecting on the west sido of Eden avenue, Mount Auburn, Cincinnati, Ohio. a brick dwelling that is estimated to cost about $8000. Mr. George W. Rapp, of Cincinnati, is the architect who prepared the plans.

Mr. E. F. Fassett, architect, of Denver, Col., has lately completed the plans for a dwelling house, 44 x 60 feet in size, that is now being erected on Glenarm street, between Lincoln avenue and Twenty-first street, for Mr. J. F. Spaulding. The structure will be of stone and brick, two stories in hight. The cost is put at $10,000. Messrs. P. McDonald and E. J. Noles are the builders.

The contracts have been let for the erection of a new bank building for the Merchants' National Bank, on the corner of Superior and Bank streets, Cleveland, Ohio. The estimated cost of the structure is about $150,000, and it is expected to be completed by May, 1884. Mr. Gordon W. Lloyd, of Detroit, Mich., is the architect.

At East Greenwich, R. I., ground has been broken tor the foundations of a new Baptist Church, opposite the Free Library Building. The architect who furnished the plans is Mr. Charles F. Wilcox, of Providence, R. I.

Mr. James Pajean, of Evanston, Ill., is erecting a 2-story frame dwelling in the Queen Anne style of architecture. The cost will be about $5000. Mr. J. C. Cochran, of Chicago, furnished the plans.

At Hartford, Conn., the Pratt & Cady Co. are putting up a new factory building, 40 x 140 feet in plan and 2 stories in hight. They are also erecting a brass foundry that will be 30 x 60 feet in size.

Mr. J. W. Fiske, of New York, the well-known manufacturer of ornamental iron work, has recently shipped two large fountains, the l ight of which was something like 17 feet, to be used in connection with city buildings in Denver, Col. He has also sent several drinking fountains to be used in the public park in the same city.

St. Louis seems to be specially enterprising in the building of new theaters. Four years ago the Unitarian Church on Olive and Ninth streets was bought and converted into an elegant theater. Next year the People's Theater was built on Walnut and Sixth streets. Another year witnessed the enlargement and entire remodeling of the Grand Opera House, on Market street, between Fifth and Sixth streets. Last year the new Olympic was built on Fifth st., below Walnut. The year 1883 will add still another, the Standard Theater, already in progress of rapid erection at the corner of Walnut and Seventh streets. It is to be completed in time for the fall or winter dramatic season. The cost will be about $60,000. Messrs. McElfatrick & Son are the architects, and Mr. R. P. McClure is the contractor.

Mr. Albert Metcalf, of West Newton, Mass., has in progress of erection a frame dwelling, 50 x 60 feet in plan. Messrs. Allen & Kenway, of Boston, are the architects, and Mr. Milo Lucas, of Newton, the builder.

At Denver, Col., a 2½-story brick building is being put up that will be known as "The Orphans' Home." The structure will be 50 x 54 feet in plan and cost about $10,000. Mr. W. H. J. Nichols, of that city, prepared the plans.

A First Methodist Church Building, 68 x 108 feet 3 inches, is being erected at Wilton, N. H. The structure will be of brick, and the cost is estimated at $50,000. Mr. August Bemkie, of St. Louis, Mo., furnished the plans. Messrs. McGowan Brothers are the contractors, and Mr. J. C. Pellett the supervising architect of construction.

Mr. Jonathan J. Deny, architect, of Philadelphia, Pa., has just prepared the plans for a new engine-house, 28 x 95 feet in size, to be erected on Lawrence street, below Girard avenue, in that city.

Mrs. C. L. Carr is putting up a dwelling, 26 x 70 feet in plan, on Beacon street, Boston, Mass. It will be constructed of brick and stone, three stories in hight. Messrs. Allen & Henway are the architects, and Messrs. L. P. Saule and Leander Greely the contractors.

The Presbyterian congregation of Collinsville, Ill., a residence suburb of St. Louis, are having plans prepared for a new church, to be erected immediately. Mr. Chas. E. Illsley, of St. Louis, is their architect. The material will be brick, on stone foundations, slate roof; inside finish, white and yellow pine. Capacity of church, about 300 seats, besides gallery accommodation.

# CARPENTRY AND BUILDING

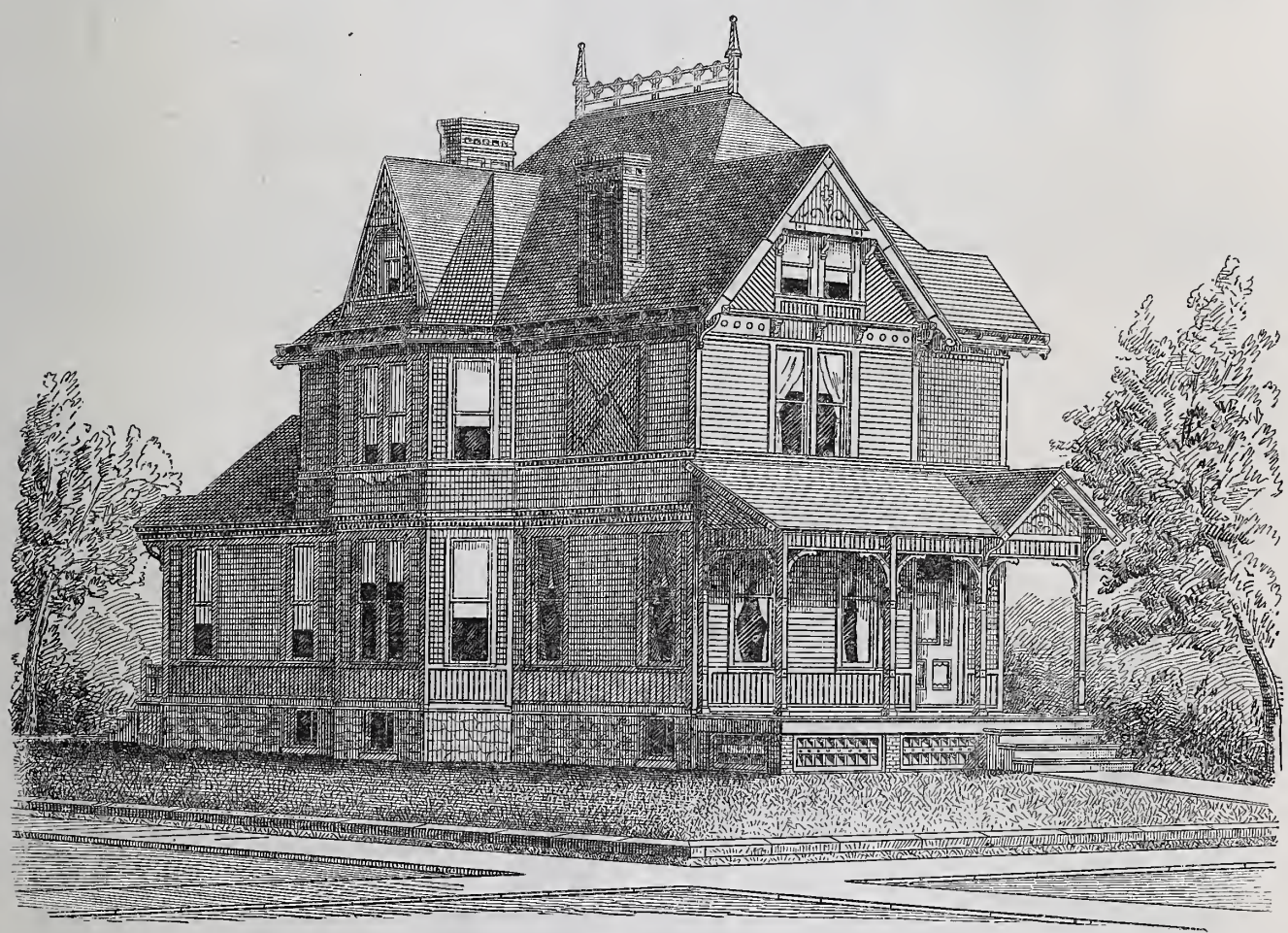
A MONTHLY JOURNAL.

VOLUME V. NEW YORK—SEPTEMBER, 1883. NUMBER 9

## First Prize Design—Eleventh Competition.

The engravings submitted herewith are from the drawings receiving the first prize in the Eleventh Competition, the announcement of the decision in which will be found in another column. The author is Mr. F. J. Grodavent, of Syracuse, N. Y. He has given as much attention to the designing of a comparatively cheap house as is ordinarily bestowed upon mansions costing ten times the sum. For lack of space we are unable to give all the details which Mr. Grodavent has furnished in this number, but expect to present the remainder in our next issue. The author has exceeded the requirements of the competition in submitting four elevations in the place of two that we demanded. His reason for this, as explained in a note accompanying the designs, is that the additional elevations are always convenient for the builder in constructing the work. As the object we have in publishing designs of this character is to facilitate builders' work, we have taken great pleasure in engraving the additional designs which Mr. Grodavent has furnished.

In describing the house as he has designed it, the author says that, owing to the narrow hall, he has set the newel square with the stairs, as the turn, while forming a good feature in a wider hall, is in the nature of a mistake in the present instance. To this extent his details vary from the floor plans as originally published, and which we have brought forward (Figs. 4 and 6). A very fine detail of the stairs, showing the feature to which this remark refers, has been submitted by Mr. Grodavent, and will appear among the details to be published next month. Referring to the exterior finish, the author says that instead of the molded belting above the first-story windows, a reduction in cost might be made by substituting a plain band on a line with the head casing. A detail of the work as it is at present designed is shown in Fig. 20, on page 174. The small gable on the north, a detail of which appears on page 173, the author says might be considered by some as an unnecessary expense, yet he thinks its absence would destroy the pleasing effect now found in the elevation of that side. He says, further, that no intention was had of utilizing the attic, although windows are placed on all sides, the object of the latter being for external appearance and ventilation. With these brief remarks relating to the design, we submit to our readers one of the most complete sets of drawings which have ever come into our hands. Relating, as they do, to a cheap house, they are of special value to our readers.



PERSPECTIVE VIEW OF SEVEN-ROOM HOUSE, AWARDED THE FIRST PRIZE IN THE ELEVENTH COMPETITION.
FRANK J. GRODAVENT, ARCHITECT, SYRACUSE N. Y.

## The Trade in Building Materials.

This country has the advantage of great capability in producing varieties of building materials, but the contiguity of the British provinces leads to such importations as freestone and laths, and in cements—a comparatively new industry in this country—a considerable importation takes place from England and the Continent, which has reached so far this year to about 150,000 barrels. Scotch freestone for basements and trimmings is being imported on an increasing scale. On the other hand, we export our bluestone to Canada, Cuba, Mexico and South America, its special qualities recommending it for flagging and lower courses of buildings. The bluestone, granite and marble of New England handled in this city are chiefly brought here by water. All over the country cost of transport necessarily governs to a great extent the selection of stone for building, though with certain important edifices distance is allowed to offer no impediment to the conveyance of huge quantities of New England stone to remote Western cities.

The business in granite, owing to the larger scale on which buildings are now constructed, increases year by year in this section, Maine, which may be regarded as a granite State throughout its length and

breadth, supplying the larger proportion. The price of ordinary granite ranges from 75 cents to $1 per square foot; but superior qualities, which allow of a fine polish, present an attractive surface, and are not liable to become discolored, will realize as much as $10 per foot. Notwithstanding the costliness of granite, entire buildings in different parts of the country continue to be erected of this material. The stone is cut and fashioned at the quarries according to the architectural drawings, and thus, on arrival, has only to be set in place. So with a great portion of the freestone used here. The most extensive employment of Maine granite in this country has been in the construction of the piers and approaches of the East River Bridge. There is extreme competition among the granite quarrymen, and, owing to the abundance and variety of the stone, new specimens are being continually brought to market, but it is difficult to place any new description. The brownstone with which New York is supplied, only obtainable from beds of limited location in Paterson, N. J., and Portland, Conn., is, as a consequence, well controlled by the quarry owners. Their sales are chiefly in New York, Brooklyn and Boston. The stone goes no further than Pennsylvania.

Bluestone has been employed for flagging

*First Prize Design, Eleventh Competition.—Fig. 2.—Front Elevation (East).—Scale, ⅛ Inch to the Foot.*

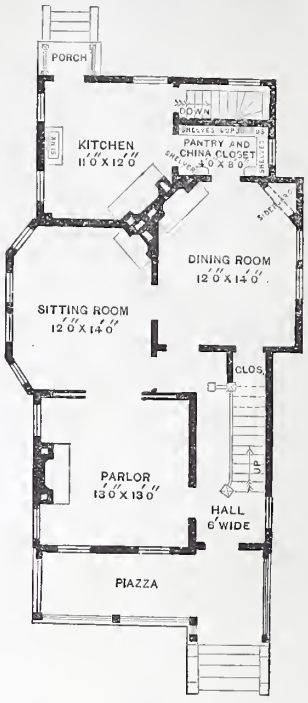



*Fig. 4.—First Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.*

*Fig. 3.—Side Elevation (South).—Scale, ⅛ Inch to the Foot.*

and building purposes for half a century, but its extensive use has been more recent. Previous to the adoption here of North River stone the quarries on the Connecticut River cutting and dressing both bluestone and freestone has been greatly reduced of late years by the powerful iron planers employed for these purposes.

*First Prize Design, Eleventh Competition.—Fig. 5.—Side Elevation, (North).—Scale, ⅛ Inch to the Foot.*

were chiefly drawn on for New York flagging. Pennsylvania supplies New York with a moderate proportion. This stone, which is extensively used for trimmings for buildings, for water tables, lower sills, lintels, large platforms, and for rubbing and polishing, goes to all parts of the country. The

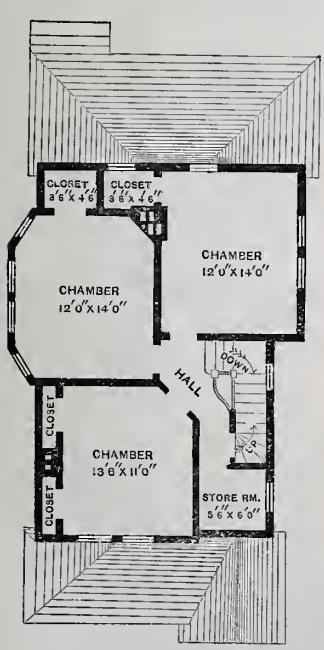



*Fig. 6.—Second Floor Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.*

cost of the rough-quarried stone handled here does not exceed $3,000,000 per annum, but the labor expended in shaping it, with cost of freight, brings this amount up to $9,000,000. The figures given for freestone (brown) by qualified estimators closely approximate to the above. Cost of labor in

The marble used in this section, a good part of it employed in interiors for mantels, is from Vermont, which supplies every desirable quality and color. Limestone from Ohio, Indiana, and even more distant States, is also furnished. An important contribution to our building materials is in Portland stone from Kentucky, of similar quality to the famous English stone of that name. Artificial building stones have come into prominence of late in the way of concrete blocks, tiles, &c. Of these terra-cotta, both for purposes of ornament and utility, is the most prominent, being widely used for architectural trimmings, carved moldings, bands, cornices and for porches. It is found suitable

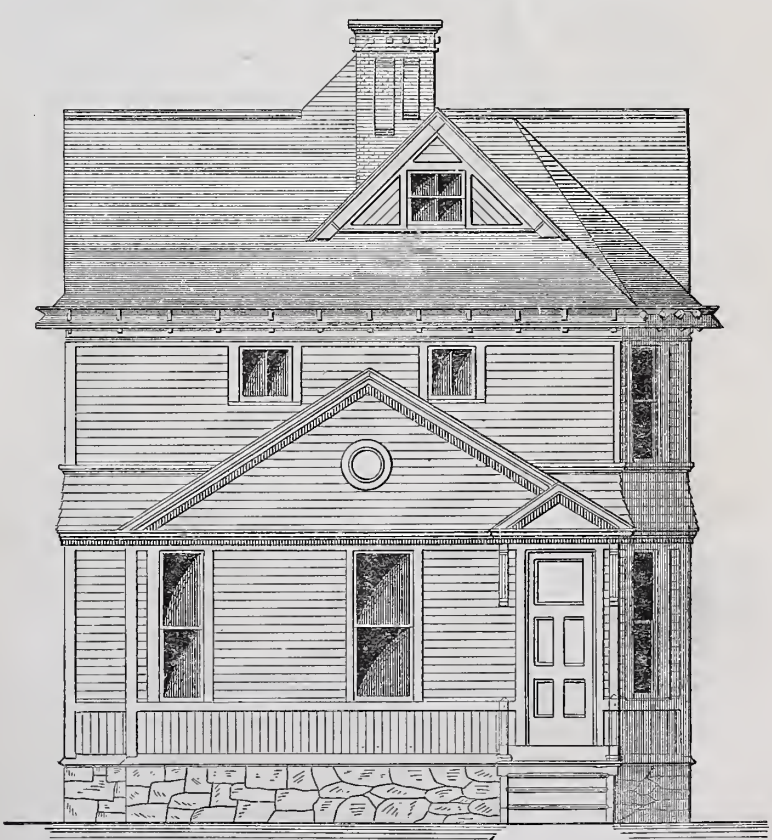
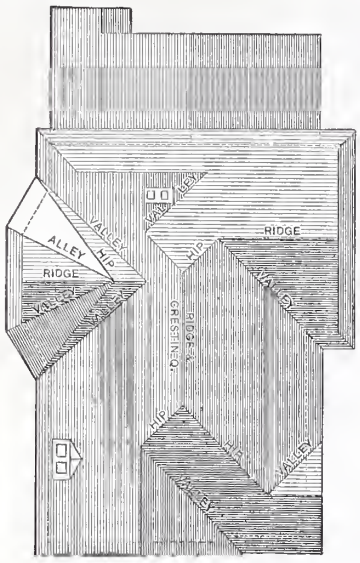


*Fig. 7.—Rear Elevation (West).—Scale, ⅛ Inch to the Foot.*

for substantial work in which strength and durability are primarily essential. Terra-cotta has served in an important degree to aid the present general adoption of brick in structures by affording effectual contrast and aiding in picturesque design. The brick trade of New York is enormous The supply is chiefly obtained from North River establishments, which furnish every desirable variety of texture, form and color.




*First Prize Design, Eleventh Competition.—Fig.* 8.*—Roof Plan.—Scale,* $\frac{1}{16}$ *Inch to the Foot.*

not only by the activity of building, but also by the favorable character or otherwise of the season for the manufacturer. Enameled bricks for lining interiors and for floorings are extensively imported and to some extent manufactured iu this country. Some new buildings contain several hundred thousand. Construction iron enters more largely than ever into our buildings, and ranks essentially, though not nominally, under building materials. Estimates for the quantities required are obtained by architects or contractors direct from the iron founders, whose works are on a large scale. Iron has found uses in building never dreamed of in old timber days, being adapted for beams and girders, pillars, stairways, balustrades, floorings and landings, and for first stories of store frontages. Omitting from the present notice other building materials, we may mention that 150,000,000 laths are sold in this market annually, half the amount coming from St. John, N. B. Of lime, 1,500,000 barrels are placed each year on the New York market. In Portland cement, both in foreign and home manufacture, an increasing business is being done. The sixteen cement manufacturers of Rosendale, Ulster County, N. Y., alone supply 1,600,000 barrels per annum. There are about the same number of manufacturers in Louisville, Ky., and iu Pennsylvania.

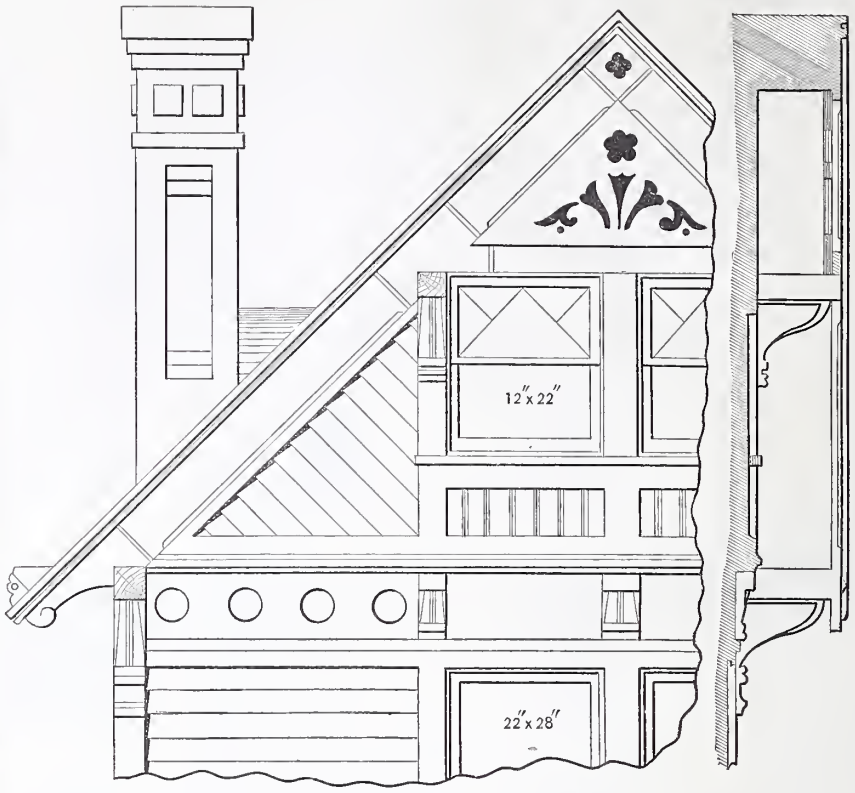



*Fig.* 10.*—Detail of Front Gable.—Scale,* $\frac{3}{8}$ *Inch to the Foot.*

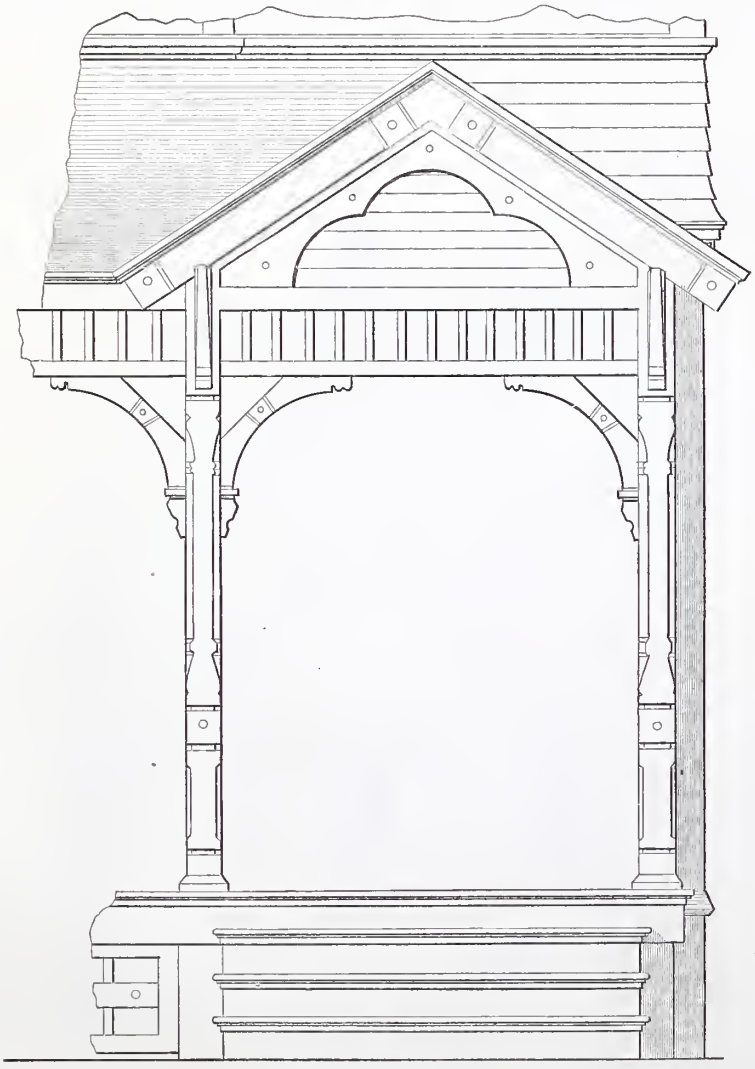


*Fig.* 9.*—Detail of Piazza, Front Elevation.—Scale,* $\frac{3}{8}$ *Inch to the Foot.*

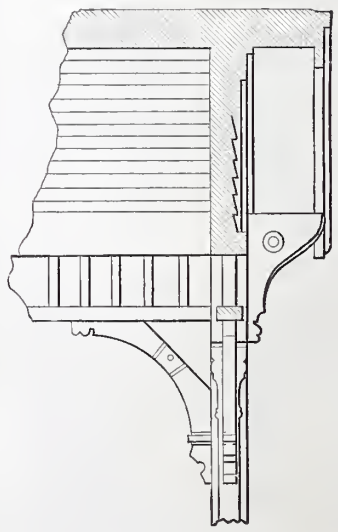


*Fig.* 11.*—Section Through Gable in Front Piazza.—Scale,* $\frac{3}{8}$ *Inch to the Foot.*

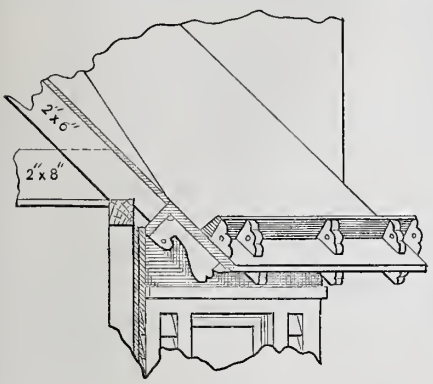
The number handled in New York alone may be put at from 700,000,000 to 800,000,000 per annum. The average cost, estimated by the carload, is $6 to $7. The cost is affected

From the building or the choosing of the house we inhabit, to the selection of the smallest knick-knack withiu it, these two considerations are at war within us—what we want aud what is supposed to be "the thing."

## Lime—Its Philosophy.

BY J. D. HOLLAND, M. E.

There are many practical mechanics who take advantage of the laws of nature by experience, without knowing to what particular laws they are indebted for success in their several arts, and the result often is that when there is a failure of any kind, they find themselves unable to account for it, and are often at a loss to understand the cause. There are many of this class of mechanics, and they are among the most skillful, who do not generally understand the natural law by which lime forms a cement. It is believed by many that the cement is caused by the adhesive qualities of the lime, when the truth of the matter is, lime is but slightly adhesive in itself, for if we rub a lump of lime-mortar between the fingers, which has just been made up and dried, it will crumble like sand; but another lump of the same kind of mortar which has been made up for a month or two, especially if it had been kept damp during that time, and then dried, will be found very difficult to crumble. The cause is this: The latter has time to combine with a portion of carbonic-acid gas, and the former has not, and it is only upon this combination that we can depend for a good cement. The mortar should be prepared in that way which will the most readily admit the gas, for as the latter constitutes not more than the thousandth part of the atmosphere, the process must necessarily go on slowly. The cement should be made by pouring the water on the lime, and the sand should not




*First Prize Design, Eleventh Competition.—Fig. 12.—Detail of Main Gutter, Being a Partial Elevation of Octagonal Projection on South Side.—Scale, ⅜ Inch to the Foot.*

*Fig. 14.—Elevation of Small Gable on North Side, with Second Story Window.—Scale, ⅜ Inch to the Foot.*

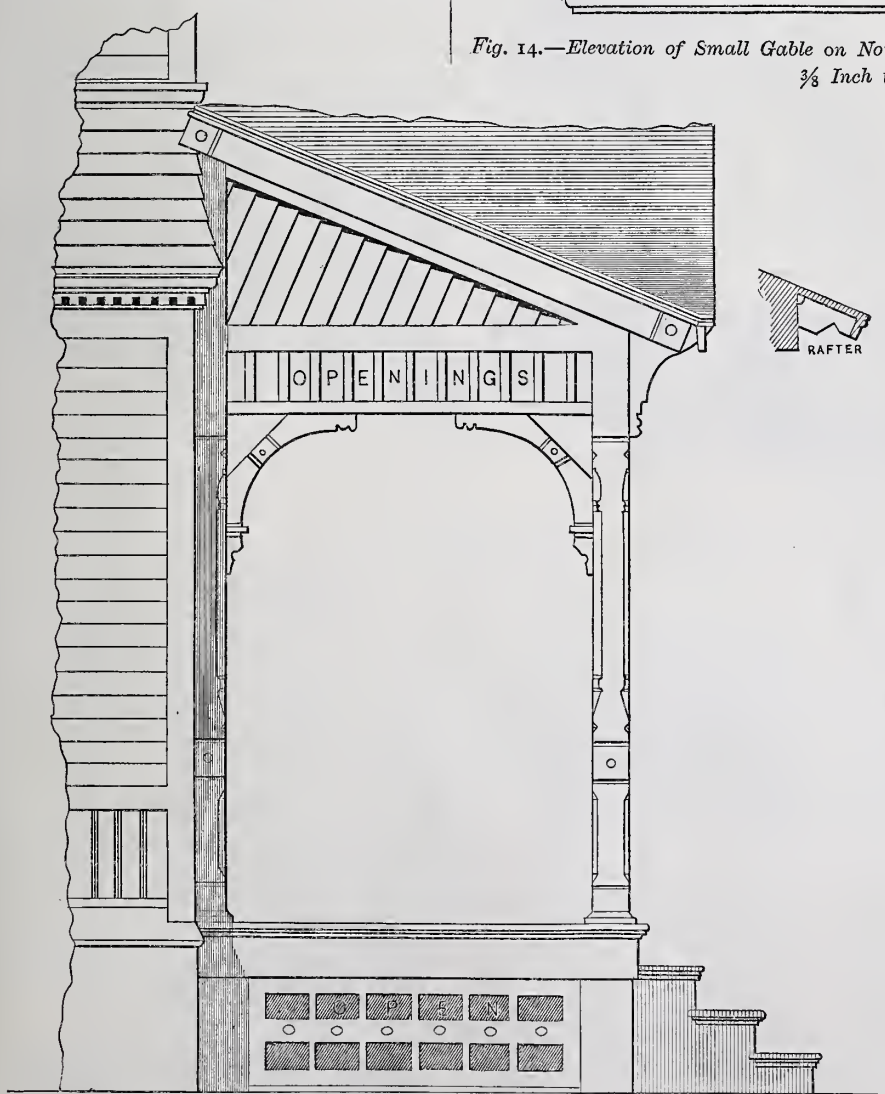



*Fig. 13.—End View of Piazza.—Scale, ⅜ Inch to the Foot.*

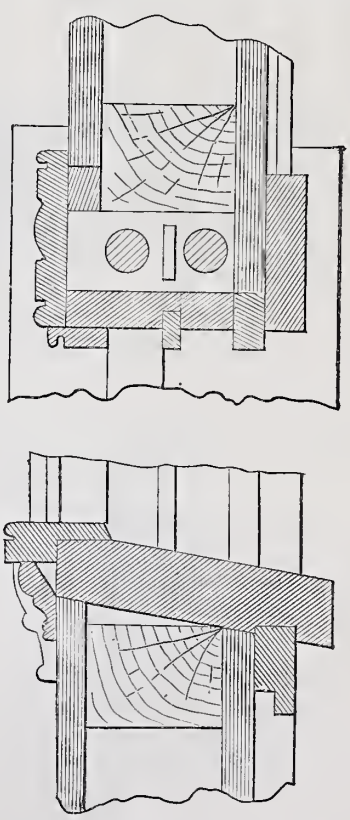
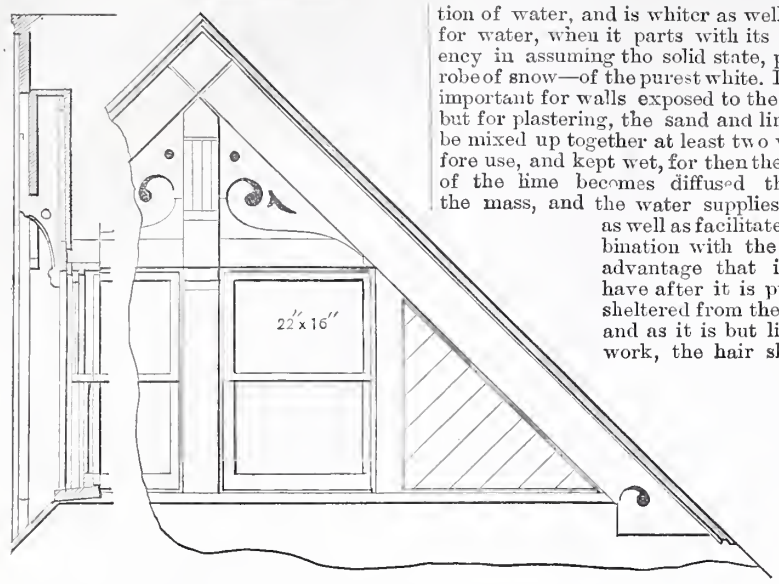


*Fig. 15.—Sections Showing Window Finish.—Scale, 2 Inches to the Foot.*




*First Prize Design, Eleventh Competition.—Fig.* 16.—*Detail of Large Gable on North Elevation.—Scale, ⅜ Inch to the Foot.*

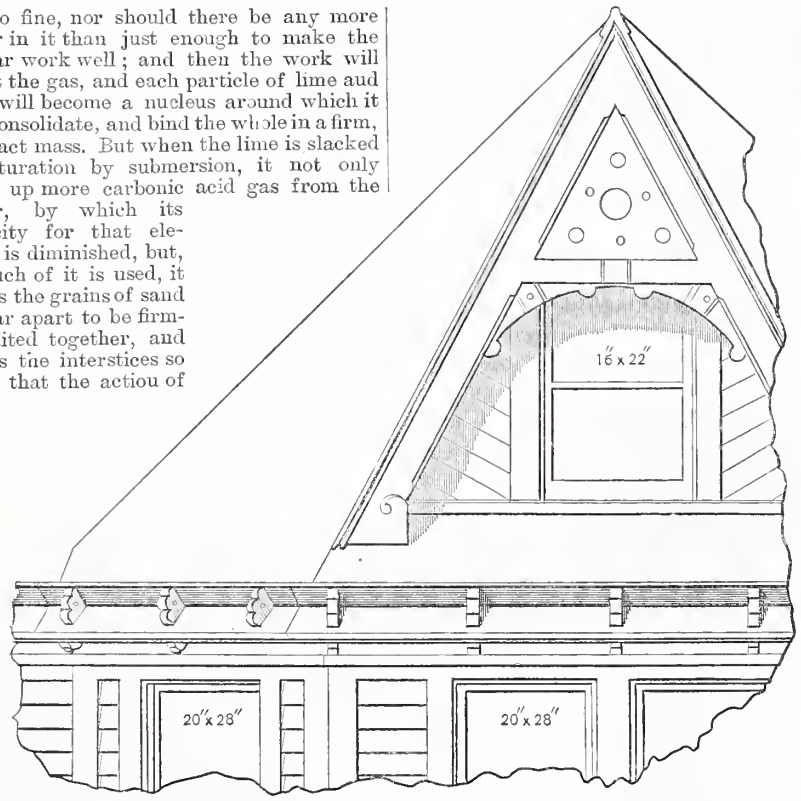



*Fig.* 17.—*Detail of Gable over Octagonal Projection on South Elevation.—Scale, ⅜ Inch to the Foot.*

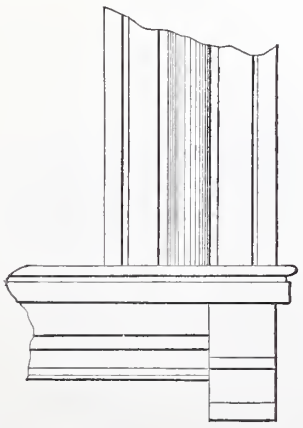


*Fig.* 18.—*Window Stool and Trimming.—Scale, 2 Inches to the Foot.*

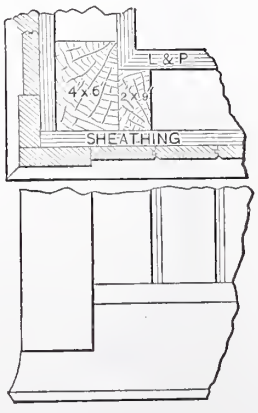



*Fig.* 19.—*Elevation and Section at Line of Water-Sill.—Scale,* 1 *Inch to the Foot.*

tion of water, and is whiter as well as finer, for water, when it parts with its transparency in assuming the solid state, puts on a robe of snow—of the purest white. It is not so important for walls exposed to the weather, but for plastering, the sand and lime should be mixed up together at least two weeks before use, and kept wet, for then the strength of the lime becomes diffused throughout the mass, and the water supplies the gas, as well as facilitates its combination with the lime, an advantage that it cannot have after it is put on and sheltered from the weather, and as it is but little more work, the hair should not be too fine, nor should there be any more water in it than just enough to make the mortar work well; and then the work will admit the gas, and each particle of lime and sand will become a nucleus around which it will consolidate, and bind the whole in a firm, compact mass. But when the lime is slacked to saturation by submersion, it not only takes up more carbonic acid gas from the water, by which its capacity for that element is diminished, but, if much of it is used, it places the grains of sand too far apart to be firmly united together, and leaves the interstices so small that the action of the gas soon closes them on the outside, and so prevents further entrance. This is the best way to slack it, however, for ornamental work, because it combines with a larger portion of water, when it is put in until the mortar is ready for use, as it is apt to become decomposed by the wet lime. A thin crust may be often noticed adhering tenaciously to the backs of plastering trowels, and about the shanks of brick trowels. This is a common specimen of this combination (carbonate of lime), and is accelerated by the free exposure of those parts to the air.

Carbon in the solid state decomposes charcoal and the diamond, and in combination with lime, marble and limestone. When any of those substances are burned, or when timber is decomposed by time, the carbon is driven off in the aeriform state, in which it mingles with the atmosphere, to be again taken up by lime, growing trees, &c. So that, strange as it may appear, the carbon liberated by the burning of Rome under Nero, or the burning of Chicago by Mrs. O'Leary's cow, may now occupy a place in a modern mansion, or still more modern log dwelling on the plains, or it may form a part of those to be built up long after all that are now standing shall have crumbled in ruins—and yet people say the world is not advancing.

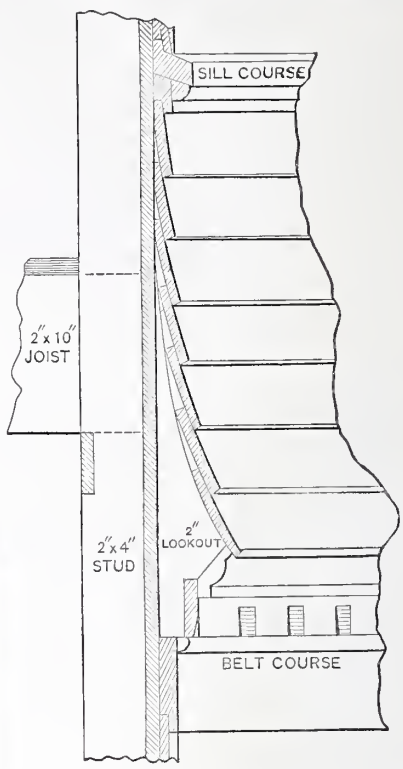



*Fig.* 20.—*Vertical Section Through Belt Course Between First and Second Stories.—Scale,* 1 *Inch to the Foot.*

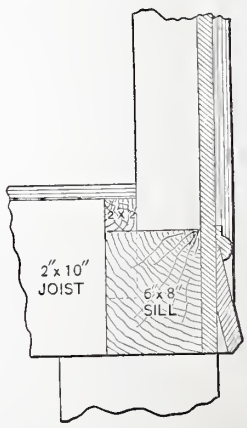



*Fig.* 21.—*Vertical Section Through Sill and Water-Table.—Scale,* 1 *Inch to the Foot.*

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Thomas Hardy, the novelist, is said to have been an architect before he took up literature, which explains why so many of his heroes are architects. An architect is a good party for a hero, anyway. What dare-devil courage it must take to make a house cost four times as much as you've told the builder it would!

## Practical Stone Cutting.

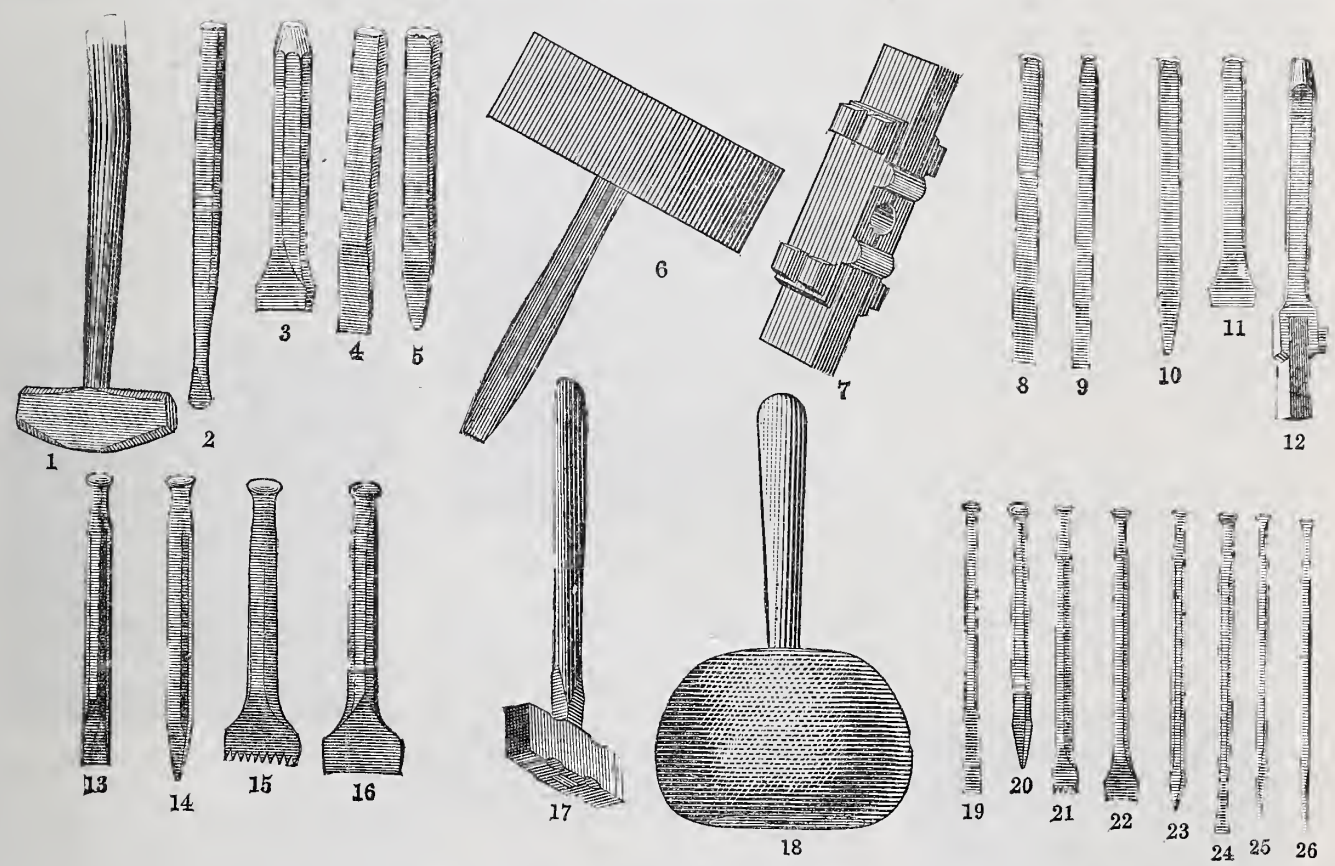
Many books have been written upon the mason's art, and many articles have appeared in technical journals describing the various operations pertaining thereto. Very little, however, has yet been printed that is satisfactory to the mechanics engaged in that line, or which affords an adequate knowledge of the mason's work to those who desire a theoretical acquaintance with it. Prof. W. P. Trowbridge, of the Columbia School of Mines, of this city, has recently made some investigations in the direction of practical work of this kind, which are of more value to mechanics in the building trades than anything else we have ever seen. As has been mentioned in our columns before, an addition has recently been been made to the college buildings, and accordingly opportunities were presented to the faculty of coming in contact with the men practically engaged in stonework and other parts of the building construction. Professor Trowbridge improved the occasion by obtaining from the stone masons practical information as to the operations of stone-cutting, and with regard to the various tools employed therein, and the different cuts and finishes left upon stonework. In his investigations he was assisted by Mr. Marcus Murray, a stonecutter employed in the college work, Professor Munroe and Mr. Greenleaf, an instructor in the School of Mines. The results of the investigation, together with photographs of specimen blocks which were cut in illustration of the different parts of the work, were embodied in a paper published in the *School of Mines Quarterly* for June last. We have been allowed by Professor Trowbridge to inspect the specimens, which were not very satisfactorily represented by the photographs in the paper referred to, and from them we have prepared the illustrations presented herewith. We are also indebted to the same source for the originals from which our engraving of the stone-cuting tools were made. In the following paragraphs we have embodied the principal part of Professor Trowbridge's paper.

The materials employed in engineering can seldom be used without having been first subjected to special mechanical preparations, depending on the uses to which they are to be applied. It may happen that the cost of the raw or marketable material is very small compared with the exponse of shaping and dressing it for use; or, on the other hand, it may be that the quantity used furnishes the chief item to be considered, the work of preparation involving little labor. In stone masonry the relations between these two items of expense vary greatly, common rubble representing one extreme and the highly-carved elements or parts of some architectural structures the other.

In ordinary engineering works in which stone masonry is employed this variability in cost depends principally on the amount of work which is expended on the exposed surfaces or faces of the stones, the necessary labor of preparing the beds and joints being to some extent the same for all cases. The dressing of the exposed faces, however, varies with the object which the masonry is to serve, with the taste of the architect or engineer, or the requirements of architectural design. In architectural masonry, in which the faces of the stones are not only sometimes highly wrought, but where moldings, bosses and carved work form especial features in the design, the work of the stonecutter becomes predominant, and a large part of the cost of such stonework is to be found in the cutting. It is important, therefore, that the young engineer and architect should be familiar with the details of an art which plays such an important part in their designs—a necessity which arises chiefly from the difficulty of estimating the cost of any work, unless its technical character can be specified, and the further difficulty of a proper inspection or supervision, unless the exact quality of the work done can be compared with some standard.

The engraving on this page shows a complete set of stonecutter's tools as used in cutting both hard and soft stone. The tools used for cutting hard stone, such as granite, are all hammer-head tools and are shown in the upper row, and embrace Nos. 1 to 12, inclusive. They are divided into two classes, the first embracing from No. 1 to No. 7, inclusive, being the tools used for plane surfaces, while the latter, embracing No. 1 and Nos. 8 to 12, inclusive, are tools used for moldings. The names of the tools, represented in the order in which they appear in the engraving, are as follows: No. 1, hand hammer; No. 2, ¾-inch drill; No. 3, pitching tool; No. 4, ¾-inch chisel; No. 5, ⅞-inch point: No. 6, pane axe; No. 7, patent ax. This tool is also called a bush hammer in the eastern portion of the country. It is used on hard stone in two sizes, 6 and 8, cut with ⅞-inch jaw, and 10 and 12, cut with ⅝-inch jaw. No. 8, ½-inch chisel; No. 9, ⅜-inch chisel; No. 10, ½-inch point; No. 11, 1¼-inch drove; No. 12, bush chisel, 10-inch cut, ⅝-inch jaw.

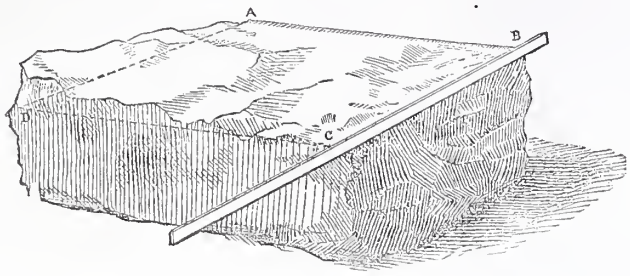
The tools used for soft stone, such as Ohio stone and the like, are all of the description called mallet-head tools, a mallet being used for the purpose of driving them. These divide into three classes, being, first, tools for plane surfaces, embracing Nos. 13 to 17 inclusive; second, tools for moldings, embracing Nos. 18 to 22, inclusive; and, third, tools for carving embracing Nos. 23 to 26, inclusive. In the first class a droving mallet of about 6 pounds weight is also required, and in the last class a carving mallet of 2 to 3 pounds is required. The names of the tools, as numbered in the engraving, are as follows: No. 13, ¾-inch drafting chisel; No. 14, ¾-inch point; No. 15, 2½-inch tooth chisel; No. 16, 2½-inch drove; No. 17, bush hammer, called diamond hammer in Europe; No. 18, pointing mallet, 4 pounds; No. 19, ½-inch chisel; No. 20, molding point; No. 21, ⅝-inch molding tooth chisel; No. 22, ¾-inch molding chisel; No. 23, carving point; No. 24, ⅜-inch carving splitter; No. 25, ¼-inch carving splitter; No. 26, $\frac{3}{16}$-inch carving splitter.




*Practical Stone Cutting.—Fig. 1.—Tools Used by Stone Masons in Hard and Soft Stone.*

The first practical work to which attention is directed in the paper to which we have referred is the method of squaring up an irregular block of stone, the general operations connected with which are shown in Fig. 1. In cutting ashlar for a quay wall, a canal lock or other structure out of granite stone, where the face of the same is to be brought to a smooth surface, the foreman's or master mechanic's first duty is to tell the workman to "banker" up the widest bed. It is from this bed that all the other faces of the stone are laid out. To banker up the bed, the workman draws a line with iron ore or black lead on the face of the stone, as close to the surface of the bed as practicable; he then takes a 4½-pound hammer and a pitching tool and pitches or smalls off all *débris* or waste above the line; he then takes a chisel about 8 inches long, of ⅞-inch bar Jessop's cast steel, and chisels a draft on the bed, keeping as close as physical power will

permit. The skilled workman will adhere to this; the closer he keeps to the pitching the sooner he will accomplish a straight draft; the unskilled mechanic will not respect a drawn line, and will keep chiseling up hill and down; he will have it like waves on the ocean until shown how to do it correctly. After this first draft has been made, from A to B, he places his straight-edge, previously rubbed with red chalk; when this is laid on




*Practical Stone Cutting.—Fig. 2.—Method of Squaring an Irregular Block of Stone.*

it will leave red spots on the stone. This shows what part of the draft is high. He goes to work and chisels off the red spots, and repeats this until the straight-edge, when applied, shows a red line on the whole length of the draft. His next work is to find out which is the lowest corner (C) of the bed of the stone; he will stoop and sight the stone, and thus he will soon discover which is the lowest corner. He will then run a draft, B C, from the one that has been completed to this point. His next work is to place a straight-edge along this draft. He then goes to the corner C of the stone, drops on his right knee and sights, taking the draft A B as his level, and in the same glance he catches the point D, where the true bed must cut the remaining corner of the block. When this is done, he straightens a draft from A to D, and from D to C.

After the four drafts are completed, he takes a 7/8-inch hammer-point, 8 or 9 inch long, and points off the *débris* within 1/4 inch of the surface of drafts; he then takes his pane ax on it until he gets down so that the straight-edge touches all four of the drafts; then it is complete. He has only used one size of chisel, one size of point and a pane ax, to complete this bed. He draws a line on the bed close to the face, pitches it off, turns up the stone and runs a careful arris-

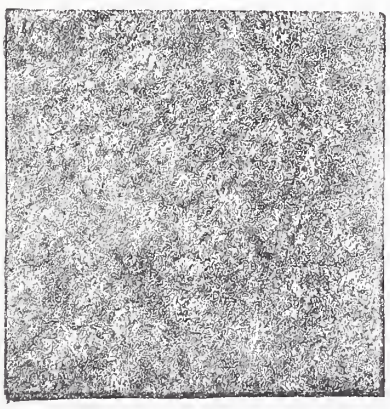


*Fig. 3.—Example of Pointed Face Granite Work.*

draft with a second size of chisel of 5/8-inch steel bar (the chisel end must not be more than 5/8 inch wide). When the arris-draft is complete he cuts another draft across one of the ends at a right angle from the bed. He now has two drafts; he puts the straight-edge on the cross-draft and sights the corner of the face, finding the right point as he has previously done for the bed. He now proceeds to complete his four drafts, and then he points off the *débris* to within 1/2 inch of the level of drafts; he then takes his pane ax and hammers to within 1/8 inch of draft level; then he takes either a five or six cut patent ax and hammers it down to the level of draft. If the surface is to be cut as fine as the stone used in the construction of the New York Post Office, the eight-cut is applied by striking the surface all over once, and then the ten-cut is applied all over; it is then finished. Should it be done similar to that for the State, Navy and War Department buildings in Washington—the best on record—the thirteen-cut should be applied. It is so fine that it has changed the Richmond granite columns of the west façade portico to a bluish shade. The face of the stone being cut, the workman gauges the hight, pitches off to the line, runs a careful arris-draft with a 5/8-inch chisel, and points off the *débris* at random, occasionally applying his square so that he does not leave the bed of

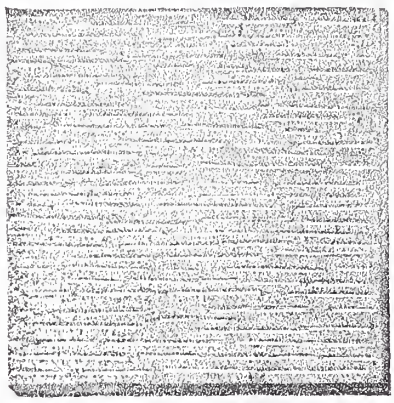


*Fig. 4.—Pane Ax Granite Work.*

the stone too slack from the face. But no draft across the bed of the stone is needed; this being the top of the stone when set, the stone-setter wishes to have it slack to give him an opportunity to spread mortar on top of it for the next stone to rest upon. He spreads fine putty close to the front arris to make a neat horizontal joint, and uses coarse mortar in the rear part of the bed; consequently he must be allowed more space for this. The bed is generally left slack to give him a chance.

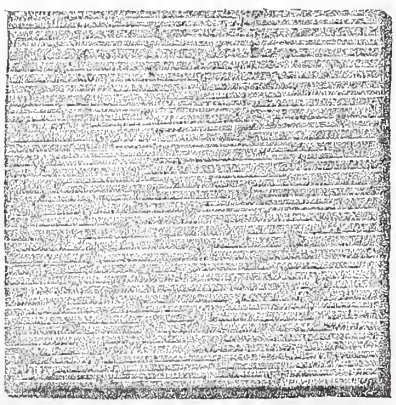


*Fig 5.—6-Cut Granite Work.*

The next work is to complete the joints. The stonecutter draws a square line on the face of the stone, the square being applied to either bed, but preferably to the first one cut, and then cuts his arris-draft, and when done applies the stock of the square to the face of the stone and draws a line on the bed for the whole depth, pitches it up, and runs a rough draft on it. No respect is paid to fine arises, but the draft must be true. He takes the joint out of winding on the same principle as when cutting the beds and the face; then he gauges the stone the required length, and cuts the remaining joint likewise. Then the block is completed.

Specimens of granite cutting are shown in Figs. 3 to 7. Fig. 3 represents what is

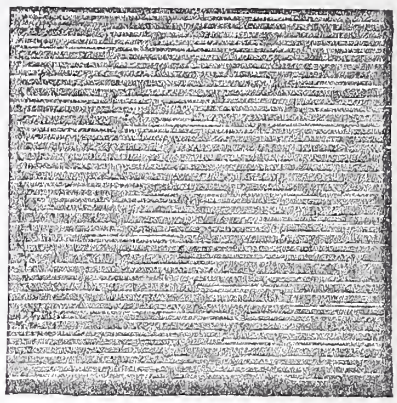


*Fig. 6.—Ten-Cut Granite Work.*

called pointed face. In producing it the stonecutter chisels out four drafts with a chisel 1 inch wide, when he points off the waste or *débris* to within 1/4 inch of the draft level with a hammer-head point; then it is ready for the pane ax. Fig. 4 represents what is called pane ax, and is the same as Fig. 3 after having been pane-axed. Fig. 5 is what is called six-cut, and shows the preceding after having been pane-axed with a 7/8-inch jaw patent ax. Fig. 6 is called ten-cut, and shows Fig. 5 after

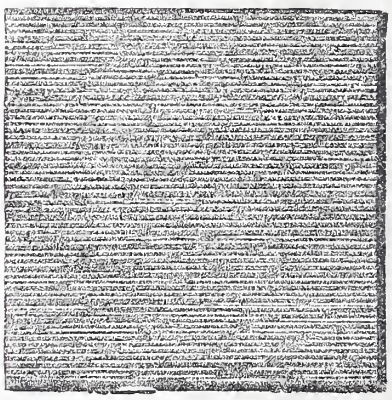


*Fig. 7.—Twelve-Cut Granite Work.*

after having been pane-axed with a ten-cut patent ax with 3/4-inch jaw. Fig. 7 is called twelve-cut, and shows Fig. 6 after having been pane-axed with a twelve-cut patent ax with a 5/8-inch jaw. The face has to receive two coats of axing from the twelve-cut before it is finished. The first of these should be axed diagonally to the impression of the ten-

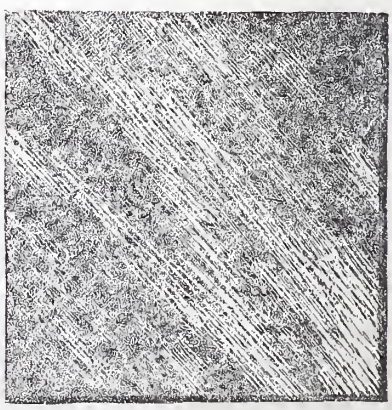


*Fig. 8—Polished Face Granite Work.*

cut. When this is done the workman must stand close to the setting bed of the stone, and strike every blow showing the impression at right angles to the bed of the stone; then the first axing is complete.

Fig. 8 shows a polished face. It represents Fig. 7 after having been polished. A handful of sharp, clean shore sand is thrown on and saturated with water, and it is then rubbed with a piece of iron until all dents and impressions have vanished. Then, applying emery and water, keep rubbing until it is as smooth as glass. Then apply the polishing powder in a liquid state or in a paste, and rub with a piece of wood in the form of a plasterer's trowel, covered with a piece of woolen cloth, until a high polish is obtained. Then the marginal draft is put on with a bush chisel, by hitting it with a hand hammer about 2½ pounds in weight.

[To be continued.]

## TRADE PUBLICATIONS.

### Well Machinery.

We are in receipt of the catalogue and price list for 1883-84 of the American Well Works, located at Aurora, Ill. The business of this company is the construction of railroad, city and farm wells, water works and the manufacture of well machinery, windmills and supplies. The first illustrated matter in the pamphlet is a description and explanation of Chapman's hydraulic well machinery. This apparatus drills and pumps a hole into the ground and brings the chips, drillings, dirt or sand out of the hole to the surface without removing the tools. The machinery is operated by means of a horse-power which is moved by one or more horses, according to the kind of work being done. The apparatus is designed for use by special contractors who make a business of putting down drilled or bored wells. Several engravings are given showing the use of the apparatus for different purposes, and an imaginary ground section is shown of a hydraulic reservoir tube well made by the drilling process employed by this company. Numerous testimonials are given indicating the satisfaction of the parties whose names are signed with the work they have inspected. Following is a list of Chapman's earth augers, succeeding which are expansion drills, and then follows a general list of tools useful in work of the kind indicated and for repairs. In the latter part of the pamphlet are cuts and prices of pumps adapted for various purposes, horse-powers, valves and fittings, steam-drilling apparatus, and a chapter on windmills. An examination of this book cannot fail to be of advantage to all those who have anything to do with providing water supply for country dwellings, towns, or railroad watering stations.

### Heat-Saving and Ventilating Grate.

We have received from Messrs. A. Jackson & Bro., 77 Beekman street, New York City, a very handsome oblong pamphlet describing the Jackson heat-saving and ventilating fireplace. By means of very skillfully prepared engravings the apparatus is first shown, after which different methods of setting are presented, and following the latter are diagrams of flues showing how the upper register can be placed under varying circumstances. The different styles in which the grate is manufactured are then presented, both by engravings and carefully prepared letter-press. A few designs of mantels are given at the close of the pamphlet. "Directions for Setting a Mantel" is the title of the text on one page, and is a chapter interesting to all who have anything to do with work of this kind.

### Sheet-Metals.

Messrs. N. & G. Taylor Co., of Philadelphia, Pa., have just issued a very handsome catalogue of nearly 300 pages, devoted to a description of sheet-metal goods, trimmings, &c., demanded by tinners, roofers and cornice makers. While the particular object of the catalogue is to serve these interests, there is much in it that is of special value to the builder who desires an intelligent knowledge of such sheet-metal work as he requires about his building. From this book a fair knowledge may be obtained of the various materials used in connection with sheet-metal work of buildings, from tin plate in the boxes to finished goods like patent conductor pipe, gutter fastenings and various odd articles, the use of which every builder understands. The book is one of the most complete of its kind that has ever been preparod, both in the amount of matter contained and in the ability with which it has been edited and compiled. In the space at our command it would be difficult to point out even its most prominent features in a way to do the subject justice. As the work is sent gratuitously to all applicants, we suggest that our readers will do well to apply for copies. Prominent among the topics discussed is that of the qualities that good roofing tin should possess. Special stress is laid upon Taylor's "Old Style" plates for this purpose. Every sheet of this brand of plates is guaranteed to be of the best charcoal-bloom iron, covered with all the tin that it will hold. The fact that a very large trade has been built up in this specialty is satisfactory proof that builders and architects are appreciating good quality in their metal work when it is offered them. Among the notable typographical features of the book are several sheets of extra thick paper introduced, representing goods the names of which are printed upon them. For example, between pages 96 and 97 is inserted a leaf of this kind prepared in imitation of galvanized iron, and so accurate is the counterfeit that at first sight one would suppose a piece of galvanized iron had been stitched in. A little further along in the book a portion of a page has been bronzed in a way to imitate sheet coppor, and is quite as successful as the example already mentioned, while near the latter part of the book black sheet iron is similarly represented. Many interesting paragraphs, as well as those containing valuable information, are interspersed with the advertising matter. The history of tin plate, useful arithmetical rules, tables of weights convenient in estimating, and a chapter on the responsibilities of common carriers, may be mentioned as examples.

### Wrought-Iron Guards.

A large poster issued by the Composite Iron Works Co., of No. 83 Reade St., New York, presents an illustration of the Bostwick patent folding gate. This gate is arranged on the general principle of what is known in mechanics as lazy tongs. The designs to which this principle has been adapted are very neat in appearance, making the work very desirable for such use as day doors for bank vaults, bank and office gates, guards for doors and windows, safety gates for baggage and sleeping cars, ferries and other similar places, entrance and drive-way gates The illustrations show the application of this principle in nearly all the places we have mentioned above. The center of the poster contains a fine engraving of the Composite Iron Works Co.'s factory, located in Long Island City. Diagrams showing the application of gates of this kind to doors and windows are also contained on the sheet. Accompanying this poster, we have received advance proofs of catalogue pages of a new work that the company are preparing, showing wrought and cast iron gates recently executed for William Astor and James Gordon Bennett, at Newport, R. I. The designs are in keeping with the many excellent specimens of work executed by this company, and show the adaptability of wrought and cast iron in combination for purposes of this character.

### Reflectors.

We have received a copy of the circular published by Mr. I. P. Frink, No. 551 Pearl street, New York, illustrating his patent reflectors for gas, kerosene, electric or day light. The reflectors manufactured by Mr. Frink have been before the public for a number of years, and have already obtained a reputation that is world-wide. A large number of the designs contained in this catalogue are of church chandeliers and side lights, and show the various ways in which the principles of construction employed by Mr. Frink may be used. A number are shown for gas jets, following which are some adapted for kerosene lamps, both singly and in clusters. Gas jets with reflectors for use in show windows, also for street lamps and for advertising signs, are presented. Several illustrations are devoted to Frink's patent daylight reflectors. One shows a dark office, presumably in the basement of a building, in which two clerks are laborously bending over ill-lighted desks, the sole illumination being from gas or lamps. The other shows the same office lighted by daylight reflected by reflectors the use of which the engravings are intended to illustrate. Diagrams showing the means of hoisting reflectors into position and of adjusting the various parts together, with price list of the different designs shown, complete the catalogue. Numerous testimonials are given, among which is the report of the committee of judges of the American Institute Exhibition, commending the reflectors as the best in style and workmanship. We understand that this catalogue is mailed to all applicants, and those who have occasion to arrange lights in any building will undoubtedly obtain information from it that will be useful to them.

### Registers and Ventilators.

We have received from Messrs. Hall & Carpenter, of Philadelphia, Pa., their price list for 1883 of warm-air registers, ventilators, &c. The goods represented are those made by the Tuttle & Bailey Mfg. Co., and are in such general use that there is little need of special description at this time. The pamphlet has been carefully prepared, and is arranged in a very convenient manner for reference. By means of wide margins space is afforded for thorough indexing, and portions of the pages being cut away so as to reveal the several titles printed on the margins, it is possible to turn to any item desired instantly. Besides this, a very comprehensive index is presented in the early part of the book, which still further facilitates references. The list is very complete, and includes prices, together with illustrations, of all the different kinds of registers and ventilators, with their trimmings, that are in general use.

### Tub, Pail and Chair Machinery.

Messrs. Goodspeed & Wyman, of Winchendon, Mass., send us their catalogue for 1883 of tub, pail, chair and other wood-working machinery. Among the machines represented is a new and improved Woodworth planer, Stimpson's improved dowel-joint machine, cylinder stave saws, tub and pail stave saws, pail lathe, improved rotary matcher, head lathe and stave planer. Among the miscellaneous wood-working machines shown are saw and boring machines, small saw bench, back-knife gauge lathe, improved gauge lathe, rod pin and doweling machine, warp-spool latho and upright boring machine.

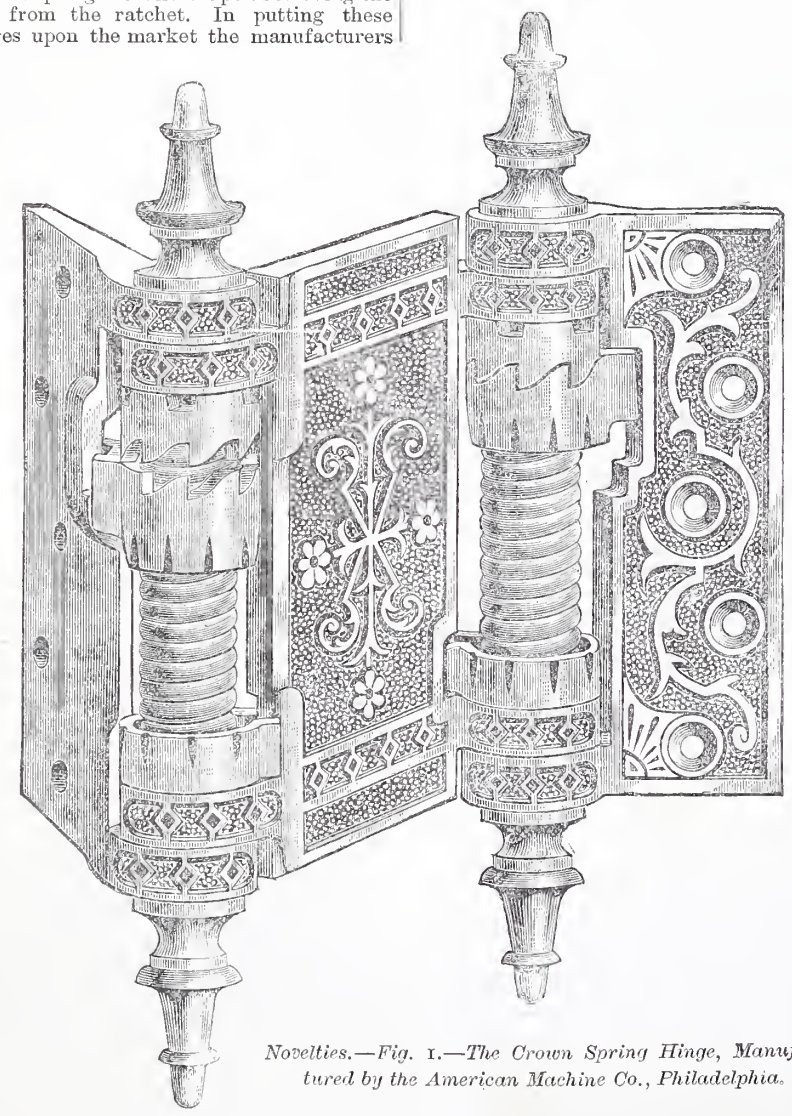
### Our Homes: How to Heat and Ventilate Them.

The above title is applied to a very artistic little pamphlet issued by the Smith & Anthony Stove Co., of Boston, Mass., descriptive of the Anthony wrought-iron furnace for warming dwellings, churches and public buildings. Unusual care and taste have been displayed in the preparation of this book, and more than usual discrimination has been used in selecting not only the matter that the pages contain, but the illustrations by which they are embellished. A number of very handsome engravings of buildings are given, representing houses, &c., that are heated with the apparatus described. At the outset, heating by warm air is briefly considered, and the requirements of sanitary heating stated. Then the advantages of wrought iron and the disadvantages of cast-iron furnaces are presented. Steam heating vs. furnace heating receives attention in a brief chapter. Engravings are then introduced illustrating the Anthony warm-air furnace, set both in portable form and in brick. Sectional cuts show the construction of the dual grate employed in this apparatus. These parts are all carefully described, and then is introduced the chapter on ventilation. A large number of testimonials are presented at the end of the work, including many well-known names in various walks of life.

## NOVELTIES.

### Crown Spring Hinges.

The American Machine Co., corner Lehigh avenue and American street, Philadelphia, Penn., are manufacturing a line of spring hinges known as the "Crown" spring hinge, under C. B. Clark's patent of April 4, 1882. We show in Fig. 1 a double-acting spring hinge, adapted for solid doors, embodying the principles employed in all the styles they manufacture. The features of the hinge are so clearly shown in the illustration that a lengthy description is not necessary. The spring is of the spiral kind, and tension is obtained by an adjustable ratchet shown in place in the hinge at the right, and shown dropped in the hinge at the left, thus illustrating the method of tightening it. The directions for putting on tension are as follows. Turn the upper ratchet with a nail to the right until the desired tension is obtained; then push the lower ratchet up into its place, as shown in the engraving. The pressure of the spring holds it securely and keeps it from falling. Tension is released by turning the upper ratchet slightly to the right, when the lower ratchet will fall down and the spring will uncoil upon removing the nail from the ratchet. In putting these hinges upon the market the manufacturers call attention to their simplicity of construction, the small liability to get out of order, and the facility with which the tension of the spring is managed. Another advantage cited is the fact that there are no loose pieces about the hinge to be lost or mislaid. They are manufactured in various grades, from very light surface spring hinges, adapted for screen doors, to double-acting hinges of the general kind shown in our engravings, adapted for solid doors. They are finished in black japan with nickel-plated steel springs; also in bronze and in full nickel, as required for different purposes.



*Novelties.—Fig. 1.—The Crown Spring Hinge, Manufactured by the American Machine Co., Philadelphia.*

### Keller's Saw-Set.

In Fig. 2 we show what is known as Keller's saw-set, which, having been manufactured for a number of years in Albany, N. Y., has achieved a good local reputation. It has recently passed into the hands of Messrs. Charles Croissant & Bro., of that place, and is now being pushed and offered to the trade generally. The engraving is a very fair representation of the device, and will be understood by the following epitome of the directions for using which are sent out with it: The set is placed on the saw, as shown in the engraving, K representing the saw blade. A is a tooth gauge, which is readily adjusted in place by the set-screw B. It moves longitudinally along the jaw E, so as to accommodate different lengths of saw teeth. The anvil upon which the tooth of the saw to be set rests is indicated in the engraving by H, while G is the set-piece and is triangular in shape. If by any accident one angle of this set-piece is injured, it can be instantly removed and another substituted, and, in turn, after those at one end have all been spoiled, it can be reversed, thus presenting three fresh corners. Each side of the gauge A is provided with a face, against which the points of the adjacent teeth are intended to touch while a tooth is being set. By means of the set-screw C, the stop D which is attached to it can be made to permit a greater or less set to the saw, according to the relative adjustment of the face of the stop B with the face of the anvil H. The set is operated by compressing the handles in the usual manner.

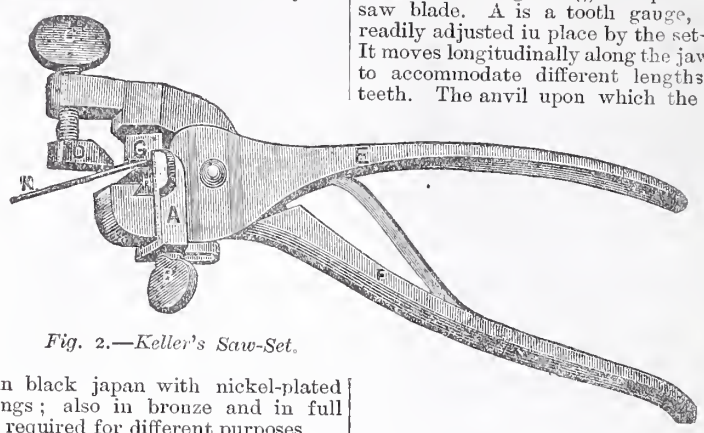


*Fig. 2.—Keller's Saw-Set.*

### Combined Door and Weather Strip.

Fig. 3 of our engravings represents a door and weather strip that is being offered by the Howard Mfg. Co., 52 Dearborn street, Chicago, Ill. This weather strip, which is intended to take the place of the ordinary threshold of an outside door, is of metal. The peculiar features incorporated in it, and which are intended to prevent beating under the door from storms, the use of garden hose and the like, are a set of channels, clearly shown in the engraving. The channel shown nearest the top in the engraving comes inside the door, the door itself coming directly over the line in which the screw holes are shown for fastening in position. The outside channel has grooves leading outward from it toward the front of the strip. Between the inner and outer channels three communicating notches are cut, which are intended to let any water that may be carried under the door, and which falls into the inside channel, flow out into the outside channel. Inasmuch as the notches do not come opposite the diagonal grooves leading from the outer channel, the wind is not liable to force the water back through them. We understand from the manufacturers that a very large number of these strips are in use, and that they have given satisfaction. We have not yet had the opportunity of giving the device a practical test, but expect to try its merits shortly, at which time we may have more to say about it to our readers. These strips are handsomely finished in various styles, including bronze and japan.

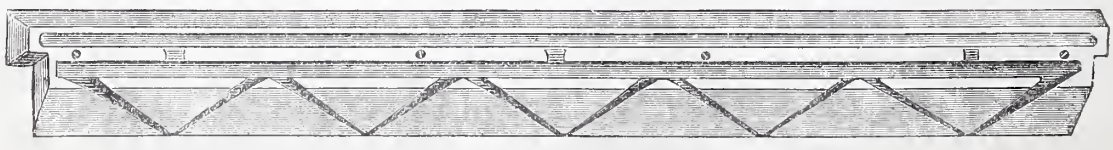
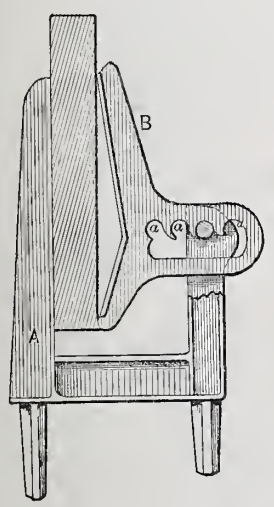


*Fig. 3.—Wood's Combined Door and Weather Strip, Made by the Howard Mfg. Co., Chicago.*

### The Crispin Bench and Saw Clamp.

The Reno Bench Vise Co., of Detroit, Mich., are offering what is known as Crispin's adjustable bench and saw clamp, a device calculated to meet a long-felt want among carpenters and builders, and which is clearly shown in Figs. 4 and 5 of the engravings. It takes the place of a wooden or iron vise

permanently attached to a work-bench, and which is useless unless the mechanic is at work in the immediate vicinity of the bench. Inasmuch as this clamp is portable and is easily put in position, it may be used on a scaffold or in any other position about buildings. In Fig. 4, the parts of which the device consists are clearly shown, while Fig. 5 shows the means of using it in connection with a common plank for a base. It is represented as holding a board for planing or sawing. The weight of the article is only 1½ pounds. There are no loose pieces to get lost. It is always available for use and is well adapted for carrying in a common tool-chest. This vise is adapted for clamping boards from ¼ inch to 2¼ inches in thickness. A special feature is its usefulness while fitting doors. Secured by the socket pins to a piece of 2 x 6 laying on the floor, it affords a convenient means for holding the door in position while it is planed down to the scribing. These goods are made from the best quality of malleable iron, and the manufacturers state are so tough that they cannot




*Novelties.—Fig. 4.—The Crispin Bench and Saw Clamp.*

be broken by a blow with the hammer. The clamp may also be used to hold a saw while filing. Messrs. C. O. Le Count & Co., 29 Chambers st., New York, are general agents.

### Improvement in Builders' Levels.

In one of the early volumes of *Carpentry and Building* we noticed a very neat leveling device adapted for builders' and mechanics' use, manufactured by Mr. John W. Harmon, of No. 65 Haverhill street, Boston, Mass. The device, as then described, consisted essentially of a telescopic tube mounted on a frame in such a manner as to be adjustable, with a spirit level in the base, and the whole so arranged upon a circular stand as to be easily regulated with reference to a horizontal position. The tube could be turned from one point of view to another, as was required. We also mentioned the graduated circle in the base by which angles could be laid off as required in staking out foundations and in amateur surveying. Recently Mr. Harmon has added some improvements to the device, making it still more useful for the various purposes for which it was intended. In Fig. 6 of our engravings we show the original instrument as we described it, with two very important additions, one being a base and tripod, better adapting it for use than in the old form, and the other being a compass, which is mounted in an appropriate box on top of the telescopic tube. The compass is portable and of such a shape as to be convenient for use when not attached to the instrument. Being set in the

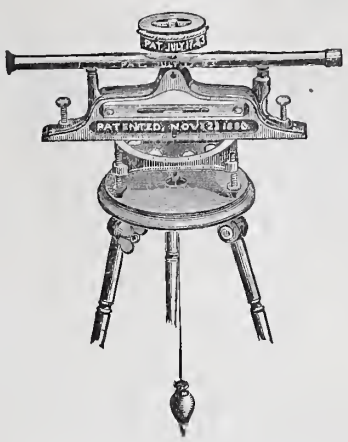



*Fig. 6.—The Harmon Level, with Tripod and Compass.*

center of the instrument with an equal amount of metal surrounding it, the manufacturer states that the needle is not affected, as it would otherwise be. In the engraving, the tripod is shown with the legs broken. As manufactured, the legs are 4 feet long and are attached to the base by being slotted and held in position with a thumb-nut and bolt. The top of the tripod is 5½ inches in diameter, and is provided with three tapering holes to receive the adjustable screw-legs of the base. The instrument swings on the center pin of the circle. A projecting pin with center hole and slot is provided for holding the plumb line. The instrument in its present shape is especially adapted to the wants of carpenters staking out buildings, of masons in leveling foundations, cellar bottoms and for all other work of a similar character.

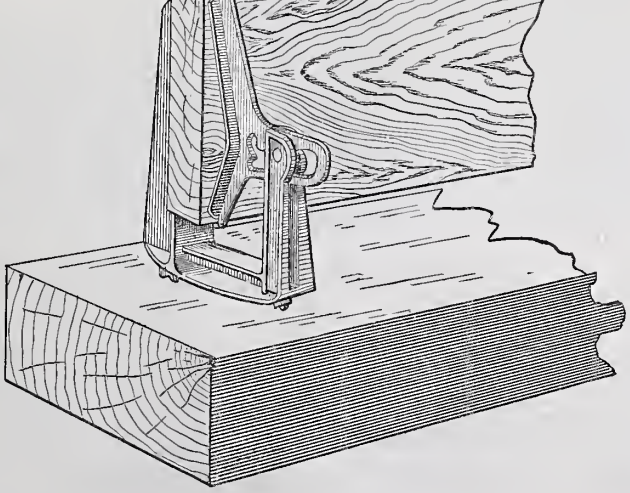


*Fig. 5.—The Clamp Mounted on a Beam and Holding a Board for Sawing or Planing.*

### Quarter-Sawed Yellow Pine.

There is no lumber, says the *Northwestern Lumberman*, that will shrink so little and wear so long as quarter-sawed. This process of sawing is particularly applicable to yellow-pine flooring, as such flooring is generally laid where it is subjected to heavy wear. A bastard-sawed board, no matter from what kind of timber it is cut, will wear rough, and sliver, if in constant use for flooring or driveways. It would be impossible to conceive of a harder, more durable floor than yellow pine would make if it were quartered. The pitch it contains would give it an advantage over oak, ash or maple in point of durability. The expense of quarter-sawing would be considerably in excess of the usual way of manufacture, but the flooring would be richly worth the difference. Quartered oak in the large markets is worth on an average $10 per 1000 more than clear oak sawed bastard, and there ought to be nearly that difference between the two kinds of yellow-pine flooring. A log, if quartered-sawed, does not yield as much lumber as if sawed the other way, and sawing it that way is a slower job. Builders should not object paying a third more for it,

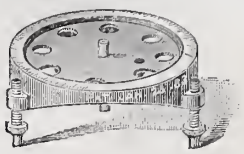


*Fig. 7.—Adjustable Base, Showing Graduated Circle.*

when they know its beauty and durability are more than doubled as compared with bastard, and every intelligent builder ought to know that such is the fact.

### Decision in the Eleventh Competition.

The result of the Eleventh Competition, which had for its subject elevations and details of the seven-room house, to the plans published in the May issue of *Carpentry and Building*, is as follows: The first prize is awarded to Mr. Frank J. Grodavent, Syracuse, N. Y. The second prize is awarded to Mr. S. A. Bishop, Smethport, Pa., and the third prize is awarded to Mr. J. F. Moore, Minneapolis, Minn. A number of very

*Fig. 8.—Compass Used on the Harmon Level.*

creditable efforts were submitted in this competition, some of which, in addition to the prize designs, we expect to publish in the future. One or two of these, perhaps, our readers will pronounce superior to the designs receiving prizes. The fact that they departed from the spirit of the specification in important particulars, however, lost them the reward to which otherwise they would have been entitled. Better houses, and better designs, in many cases, can be devised than those anticipated by the strict letter of the conditions under which a competition is conducted, but those competitors who wilfully vary in matters of this kind put themselves outside of the possibility of receiving a prize. While we are glad to have such excellent efforts as competitors occasionally give us in this way, we are always sorry, when inspecting a set of drawings, to see that the man who has labored so hard to produce them has deliberately put himself in a position where he cannot be rewarded for his pains.

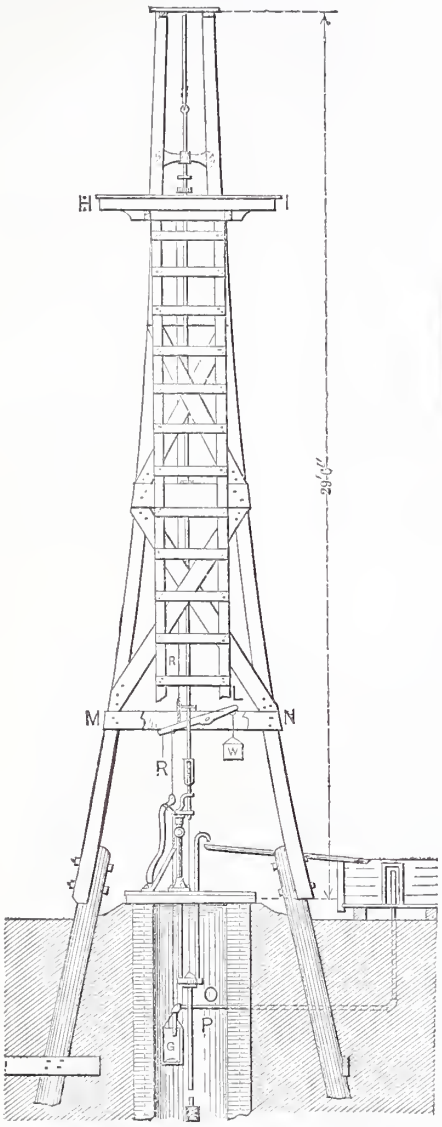
The United States has an immense number of tall buildings, and as within the last few years very many of these buildings have been burned to the ground, roasting their inmates by the score, people are very naturally beginning to take some interest in the problem of escaping from a building when its interior is on fire. The blacksmiths are the principal ones who are reaping a reward from this dread of roasting, and everywhere they can be seen at work putting up fire-escapes of the most ordinary and extraordinary character. The simplest form of escape is the iron ladder; next we have the iron ladder with platforms in front of each window; then comes the Philadelphia plan of covering these ladders and platforms with wire gauze, so that people shall not in their haste fall off and break their necks, a catastrophe quite as unpleasant in its results as the slower and more painful process of cooking. Chain-escapes and all the numerous variations of the iron-ladder plan are exceedingly common, and if the business continues good we may expect to find every building in the city fitted with some means for getting into the streets from the windows.

## Water Supply for Country Dwellings.

BY A COUNTRY PLUMBER.

IV.

In the first number of this series we showed the construction of towers calculated to carry a supply-tank in the upper portion. We shall now give some attention to cheaper tower construction—the object of the tower in this case being simply to carry the wind-




*Water Supply For Country Dwellings.—Fig 1.—Construction of Skeleton Tower for Windmills.*

mill, the storage tank being located elsewhere. Figs. 1 and 4 of the engravings show much cheaper plans of framing than anything we have yet presented, and also present methods of anchoring the towers to the ground. Each of these towers is built with four 4 x 4 timbers for corners, reaching from anchorage to bed-plate of the mill, and if sprung as shown in the illustrations, the timbers should not be spliced. If the corners are built straight, they may be spliced, but if intended for a Halladay mill must not extend above platform. Two masts, 4″ x 6″, are framed in to carry the mill. The girts are 2″ x 6″, and braces 5″, and 6″ fencing.

Fig. 1 shows the plan of anchoring commonly adopted for small mills and cheap jobs. Cedar or locust posts are set about 5 feet in the ground, with a piece of plank or scantling spiked on or gained into the post near the bottom, to prevent their pulling out. Fig. 4 shows 2 ′ x 8 ′ sills resting on stone piers, the lower being anchored with ¾″ rods, bolted to the corners and sills and attached to logs buried 5 feet in the ground. The pump shown in Fig. 1 is a common suction and lift, with both hand and windmill attachments, discharging into a stock tank near the tower, the overflow arranged to stop the mill when tank is filled. The illustrations of tower and pump are so plain that further description is unnecessary.

The material required in the construction of these towers may be of interest in this connection. The tower shown in Fig. 1 requires as follows :

| | | |
|---|---|---|
| 4 pieces, | 4 x 4 | 30 feet. |
| 2 " | 2 x 8 | 12 " |
| 4 " | 2 x 6 | 12 " |
| 2 " | 2 x 4 | 16 " |
| 4 " | 2 x 3 | 12 " |
| 4 " | 1 x 3 | 12 " |
| 8 " | 1 x 6 | 16 " |

30 feet common boards.....16 "
4 large cedar posts.
8 bolts 9″ x ½″.
15 pounds 20d. nails.
15 " 10d. "
For force-pump job add 1 piece, 2 x 10.....12 feet.

The tower shown in Fig. 4 requires the following :

| | | |
|---|---|---|
| 4 pieces, | 4 x 4 | 30 feet. |
| 5 " | 2 x 8 | 16 " |
| 3 " | 2 x 6 | 12 " |
| 2 " | 2 x 4 | 16 " |
| 4 " | 2 x 3 | 12 " |
| 4 " | 1 x 3 | 12 " |
| 8 " | 1 x 6 | 16 " |

100 feet common boards.....16 "
4 pieces log..... 5 "
4 strap bolts, 6′ 8″ x ¾″.
Strap, 1½″ x ⅜″.
4 bolts, 5½″ x ½″.
4 " 7½″ x ½″.
15 pounds 20d. nails.
20 " 10d. "
Stone or brick for pierr.
For force pump job add 1 piece, 2 x 10.....12 feet.

We shall next direct attention to a tower, Fig. 5, built with ordinary 2 x 6 inch and

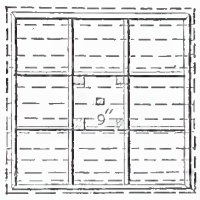



*Fig. 2.—Section through H I, in Figs. 1 and 4.*

2 x 8 inch joist, 12 and 16 feet long, for corners, which should be well spiked together; 2 x 8 inch for girts, and 1 x 6 inch fencing for braces, but 1½ x 4 or 1¼ x 5 inch for braces would present a better appearance. Such towers look very well, and may be made any desired hight by selecting longer stuff or splicing. If made higher than 28 or 30 feet to platform, additional girts and braces should be inserted, and the spread of tower—namely, 1½ inches to each foot in hight—preserved. The anchorage may be the same as shown in the illustrations in previous pages, but if posts are used they should all be set the same distance apart, no allowance being required for the thickness of the corner timbers (4 inches), as is necessary in the former examples. Towers for 12-foot and 13-foot mills may be constructed on these plans by simply increasing the strength of material used. As the manufacturers of windmills supply tower plans suited to their particular mills without charge, it will not be necessary to give designs for different sizes in this article.

The framework for mill towers may be partly put together on the ground, and by

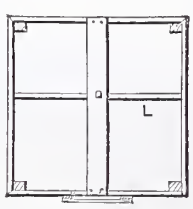



*Fig. 3.—Section through M N, in Figs. 1 and 4.*

means of pulley blocks and ropes raised to proper position. First, see that the anchor posts are properly set, and bolt holes bored correctly and level one with another all round; or, that the sills are level and anchors in place. Lay the material for two corners, or one side, on trestles, so that there is no twist in them, and the exact distance apart at top and bottom that the tower is to be built; put in the girts and the support for platform at top, and before nailing the braces draw a line from the center of the top to the center of the bottom, and see that it crosses the girts in their middle and at right angles—else the tower will not be plumb. Refer to the illustrations in this and the previous article, and note how these platform supports, which are 2 x 8 inches, are framed into tower and gained into each other where they cross. Put on one that has the gain cut in top edge. Proceed with the other side in like manner, putting the ladder

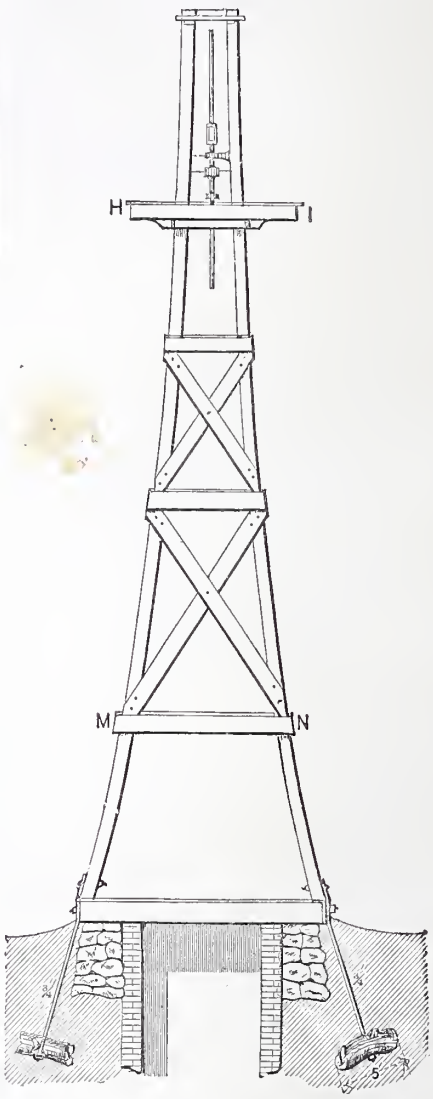


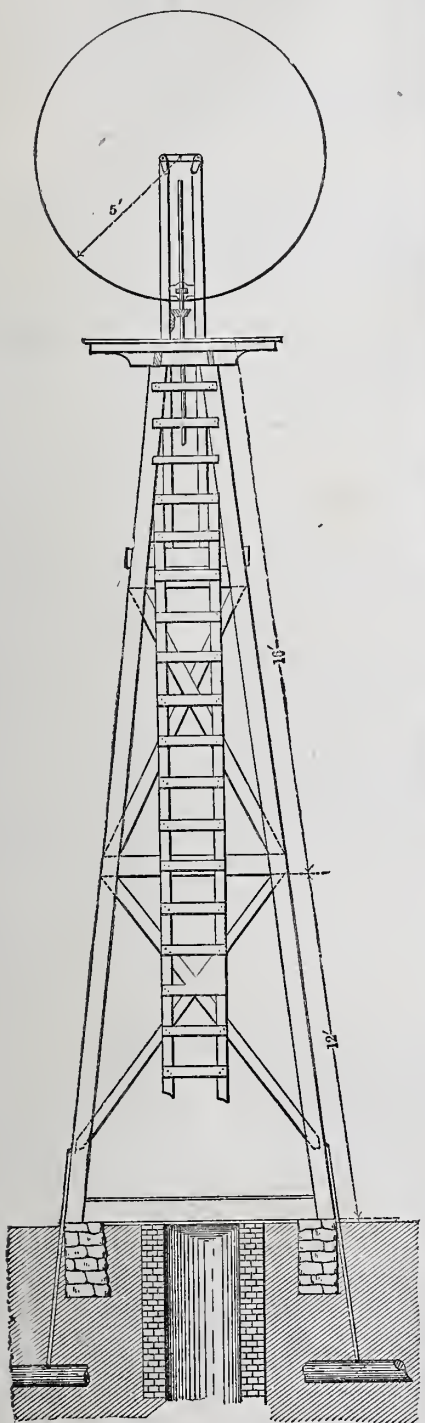

*Fig. 4.—A Simpler Form of Tower.*

on before raising it, and raise that side first, as the ladder will be found convenient to adjust the ropes and pulley blocks to raise the other side. When one side is in proper position put in the bolts and brace it on inside to prevent being pulled over, and attach pulley block and rope to raise the other side. After the two sides are raised put in the two remaining platform supports, cut girts proper length, and before nailing them fast or putting in a single brace, drop a plumb line from center of top and see that it centers to the bottom. Nail girts and braces firmly, complete platform at top, leaving an opening just over the ladder about 12 x 18 inches, and hinge a "trap" door to it. It is well, before putting down all the floor on platform, to place the mill masts and plumb them, and to place a sheet of tin underneath the floor over each corner to prevent the wet getting in and rotting the supports to platform. If from any cause an entire side cannot be raised from the ground, it may be erected piece by piece. This will necessitate considerable care to keep the framework straight and plumb, and much climbing and holding on in awkward positions.

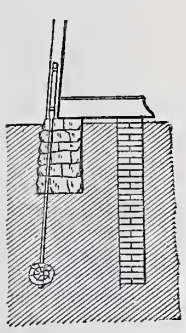
The bill of material required to erect the tower shown in Fig. 5 on stone piers is as follows :

| | | | |
|---|---|---|---|
| 1 piece. | 8 x 8...18 feet. | 4 pieces. | 2 x 6...16 feet. |
| 1 " | 6 x 6... 4½ " | 4 " | 2 x 6...12 " |
| 2 " | 4 x 6...14 " | 2 " | 2 x 4...16 " |
| 3 " | 2 x 8...18 " | 4 " | 2 x 3 .14 " |
| 5 " | 2 x 8...16 " | 4 " | 1 x 3...14 " |
| 9 " | 2 x 8. 12 " | 16 " | 1 x 6...12 " |
| 130 feet common boards. | | 2 logs. 14 feet. | |
| 4 ¾" strap bolts. | | 15 pounds 40d. nails. | |
| Strap. 1½" x ⅜". | | 15 pounds 20d. nails. | |
| 4 bolts, 9" x ½". | | 5 pounds 10d. nails. | |
| 4 " 3½" x ½". | | 10 pounds 8d. nails. | |

Stone or brick for piers.
Add for force-pump job 1 piece, 2 x 10..... 16 feet.




*Water Supply for Country Dwellings.—Fig. 5.—Tower Built of Ordinary Joists, on Stone or Brick Foundations.*



facing of the stove is of tiles richly enameled in relief, and framed in burnished brass. The hearth is of mosaic tiles and the fender of burnished brass.

## NEW PUBLICATIONS.

MODERN PERSPECTIVE. A Treatise on the Principles and Practice of Plane and Cylindrical Perspective. By William R. Ware. Published by James R Osgood & Co. One volume of text, 5½ by 8 inches; 320 pages. Portfolio of Plates, 12 by 14 inches. Price, $5.

This work is in all probability the most complete exposition of the principles and

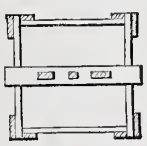


*Fig. 6.—Plan of Towers in Figs. 5 and 8 on Line of Upper Ties.*

practice of perspective drawing that has ever been published. The author has approached his subject from a standpoint differing from those who have preceded him, and he has handled it in a manner original with himself, showing the various features of perspective drawing in a clearer and more comprehensive manner than has ever before been presented to the student. One striking feature which will engage the reader's attention at the outset is a system

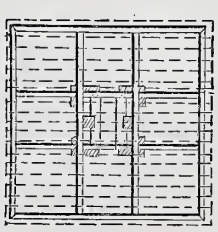


*Fig. 7.—Plan of Platform in Figs. 5 and 8.*

of nomenclature by which the lettering of each individual sketch is made to explain itself upon a system that is clearly outlined in one of the chapters contained in the book. By this means much unnecessary repetition in the text is avoided, and the work is kept at our command it would be impossible to give an exhaustive account of every feature in this work. Some of the chapters which are especially interesting, and which distinguish this work from those which have preceded it, may be mentioned. How to obtain the real proportions of a building from a perspective drawing is carefully presented, and answers questions that are frequently asked by architectural students. Cylindrical or curvilinear perspective receives careful attention, and the explanation of various methods of delineating perspective drawings is given. The eighth chapter in the work is devoted to parallel or one-pointed perspective, angular or two-pointed perspective, and oblique or three-pointed perspective. The perspective of shadows, reflections in mirrors and water and the perspective of circles are also considered. Distortions and corrections receive attention, and one plate in the portfolio is devoted to this subject. As we have already remarked, the work is the most complete of its kind that has ever been issued, and is something that every student of architecture and every designer who gives attention to perspective should endeavor to possess and study carefully.

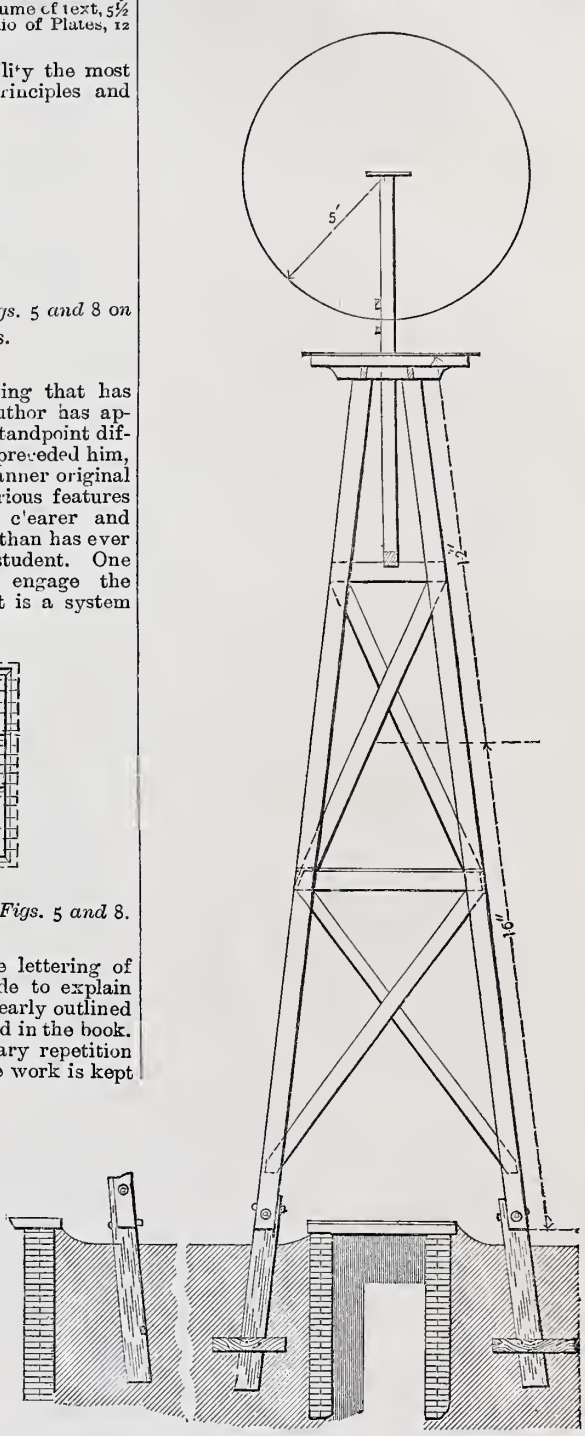



*Fig. 8.—A Modification of Fig. 5, Showing a Different Plan of Anchoring.*

For the tower shown in Fig. 8 it is as follows, built on stone foundations:

| | | | |
|---|---|---|---|
| 1 piece, | 6 x 6... 4½ feet. | 4 pieces, | 2 x 6...12 feet. |
| 2 " | 4 x 6...14 " | 2 " | 2 x 4...16 " |
| 5 " | 2 x 8...16 " | 4 " | 2 x 3...14 " |
| 9 " | 2 x 8...12 " | 4 " | 1 x 3...14 " |
| 5 " | 2 x 6...16 " | 16 " | 1 x 6...12 " |
| 50 feet common boards. | | 15 pounds 40d. nails. | |
| 4 large cedar posts. | | 10 pounds 20d. nails. | |
| 8 bolts 9" x ½". | | 10 pounds 8d. nails. | |

Add for force-pump job 1 piece, 2 x 10.... 16 feet.

Handsome fireplaces are by no means exceptional, but those intended for the well-known gas-log are capable of the greatest amount of ornamentation. One of this kind recently made has a wrought-iron background, representing an elaborate coat-of-arms design, the andirons having a floral pattern, and the within reasonable compass. One of the first things to which the author directs attention is that of drawing a perspective plan under the picture to be produced, and deriving the various lines and points from it. This idea has merit, and is a method of presenting the principles which must commend itself to every investigator in this line. An early chapter in the book is entitled the "Phenomena of Perspective." It treats of the appearance of things to the eye, viewed for doing free-hand sketching, as being different from the lines obtained by projection. The author analyzes each proposition carefully, and takes the student step by step in logical order from the simple to the complex in a manner that cannot fail to accomplish the results which he has in view. In the space

## THE ESTIMATE COMPETITION.

We present herewith the estimate receiving the first prize in the Eighth Competition. Our reasons for publishing the third-prize estimate before the first and second were stated in our issue for July. Mr. Sibley's effort received the first prize, because it was deemed the best practical model of a builder's estimate that was submitted. As will be noticed in following the schedule, Mr. Sibley's method is to take quantities and make calculations in detail upon loose sheets of paper, or otherwise, as may be most convenient, and to restrict the estimate proper to a record of results thus reached which are necessary to determine the total cost. His profits in this case are figured into the prices as he goes along, instead of being left to be added by means of a determined percentage.

### First Prize Estimate.*

BY J. D. SIBLEY.

**Mason Work.**

| | | | |
|---|---|---|---|
| Preliminary. | Engineer's services staking out cellar | $2.50 | |
| | Lumber, &c., in batter boards | 1.00 | |
| | Labor staking out | 1.50 | |
| | Privy for use of workmen | 6.00 | 11.00 |
| Excavation. | 374 yds. excavation of loam and sod, 25¢ per yd | $93.50 | |
| | 220 yds. excavation in cellar, at 20¢ per yd | 44.00 | 137.50 |
| Foundations. | Cobble stone in trenches, and labor | $22.50 | |
| | 21 perch footings, at $3.50 per perch | 73.50 | |
| | *Analysis of Cost.* | | |
| | Stone | $2.25 | |
| | Labor | .85 | |
| | Cement | .40 | |
| | Total | $3.50 | |
| | 88 perch cellar walling stone, at $2.65 | 233.20 | |
| | *Analysis of Cost.* | | |
| | Stone | $1.40 | |
| | Labor | .85 | |
| | Cement | .40 | |
| | Total | $2.65 | |
| | 90 yds. cement plastering outside of walls, at 25¢ per yd | 22.50 | 351.70 |
| Window Sills. | 9 window sills, at 75¢ each | $6.75 | 6.75 |
| Area. | 6 area steps, 19 ft. 6 in., at 25¢ per ft. | $4.90 | |
| | 1 platform | 2.50 | |
| | Grating | 1.00 | |
| | 2 perch of stone in walls | 5.30 | |
| | 10 ft. coping, 12 in. wide, at 25¢ | 2.50 | |
| | 1 threshold | 1.75 | |
| | Labor not included in the above | 10.00 | 27.95 |
| Side Walk Plinth. | 435 ft. Munson granite plinth, at 75¢ per ft. | $326.25 | |
| | 4 blocks granite, 12 in. x 12 in. x 20 in., at $3 each | 12.00 | |
| | 435 ft. x 1 ft. x 3 ft. excavation, at 6¢ per ft. | 26.10 | |
| | 435 ft. 1 x 3 rubble foundation, 78 perch, at $2.65 per perch | 206.70 | |
| | Labor setting the plinth, at 12¢ per ft. | 52.20 | 623.25 |
| Gravel Filling. | 23 yds. gravel to fill under piazza | $11.50 | 11.50 |
| Underpin. | 11,700 brick in underpinning, at $15 per M. | $175.50 | 175.50 |
| | *Analysis of Cost.* | | |
| | Brick | $8.50 | |
| | Mortar | 1.35 | |
| | Labor | 5.15 | |
| | Total | $15.00 | |
| Piers. | 1242 brick in piers, at $17 per M. | $21.11 | |
| | *Analysis of Cost.* | | |
| | Brick | $8.50 | |
| | Mortar | 1.35 | |
| | Labor | 7.15 | |
| | Total | $17.00 | |
| | 2½ perch stone in piers, at $2.65 | 6.83 | 27.94 |
| Partitions in Cellar. | 10,000 brick in cellar partitions, at $14 | $140.00 | |
| | 3 perch stone in partition foundations, at $2.65 | 7.95 | 147.95 |
| Four Chimneys | 1 chim. 1 ft. 4 in. x 5 ft. x 43 ft. = 3,500 brick. | | |
| | 1 chim. 1 ft. 8 in. x 1 ft. x 43 ft. = 1,500 brick. | | |
| | 2 chim. 1 ft. 4 in. x 5 ft. x 43 ft. = 7,600 brick. | | |
| | Total 12,600, $16 per M. | 151.20 | |
| | Amounts forward | $151.20 | $1521.04 |
| | Amounts brought forward | $151.20 | 1521.04 |
| | 6 mantel bars | 3.60 | |
| | 3 iron doors and frames | 3.75 | |
| | 450 brick in trimmer arches, at $16 per M | 7.20 | |
| | Terra-cotta panels | 10.00 | |
| | Terra-cotta caps | 40.00 | 215.75 |
| Cistern. | 3600 brick in cistern, at $16 per M. | $57.60 | |
| | Excavating for cistern | 10.00 | |
| | Filtering box | 5.00 | |
| | Manhole cover | 3.30 | |
| | Iron cover and ring | 3.00 | 78.90 |
| Drains | 85 ft. 6-in. drain tile laid, at 25¢ per ft. | $26.38 | |
| | *Analysis of Cost.* | | |
| | Tile | 15¢ | |
| | Digging and laying | 10¢ | |
| | Total | 25¢ | |
| | 16 ft. 3-in. drain tile laid, at 18¢ per ft. | 2.88 | |
| | 52 ft. 4-in. drain tile laid, at 20¢ per ft. | 10.40 | 39.66 |
| Catch Basin. | 1000 brick in catch-basin, at $16 per M. | $16.00 | |
| | North River stone top 4 x 4 = 16 ft., at 20¢ | 3.20 | |
| | Iron grating | 1.00 | |
| | Fitting | 1.50 | |
| | Excavating | 3.00 | 24.70 |
| Cesspool. | 8 perch dry stone wall | $16.00 | |
| | Domed top | 5.00 | |
| | Manhole cover | 3.30 | |
| | Iron grating | 1.00 | |
| | Excavation for cesspool | 7.00 | 32.30 |
| Cellar Bottom. | 165 yds. concrete in cellar bottom, at 60¢ per yd | $99.00 | 99.00 |
| Street Walk. | 40 yds. gravel filling in street walk, at 50¢. | $20.00 | |
| | 40 yds. cobble stone and labor, at $1.25 per yd | 50.00 | 70.00 |
| Yard Walks. | 35 yds. cobble stone in yard walks and labor | $35.00 | |
| | 13 yds. gravel-top dressing, at 50¢ | 6.50 | 41.50 |
| Grading. | 10 days' grading | $20.00 | |
| | 113 yds. of loam filling, at 40¢ per yd | 45.20 | |
| | 4 days rolling the surface | 8.00 | |
| | 4 days' work sodding around house | 8.00 | 81.20 |
| Foundation for Furnace. | 500 brick in foundation for furnace | $4.00 | |
| | Labor, mortar, &c | 8.00 | 12.00 |
| Tubs and Ventilators. | 5 chimney tubes, 40¢ each | $2.00 | |
| | 3 ventilators with cords and tassels | 7.50 | 9.50 |
| Whitewashing and Rat Proofing. | Whitewashing cellar | $15.00 | |
| | Rat proofing | 40.00 | 55.00 |
| Plastering | 450 yds. back plastering, at 18¢ per yd | $81.00 | |
| | 1350 yds. plastering, at 35¢ per yd | 472.50 | |
| | 292 ft. cornice, at 25¢ | 73.00 | |
| | 4 plate centers, at $3 each | 12.00 | |
| | 2 stucco brackets, at 75¢ each | 1.50 | 640.00 |
| Parlor Fire-Place | Hearth, Low's glazed tile | $10.00 | |
| | Marble facings | 12.00 | |
| | Soapstone lining | 6.00 | |
| | Movable iron ash grate | 3.00 | |
| | Labor setting | 9.00 | 40.00 |
| Dining Room Fire-Place | Hearth, Low's glazed tile | $10.00 | |
| | Tile facings | 5.60 | |
| | Terra-cotta panel | 7.00 | |
| | Soapstone linings | 6.00 | |
| | Moveable iron ash grate | 3.00 | |
| | Setting tiles, &c | 9.00 | 40.60 |
| Library Fire-Place | Hearth, Low's glazed tile | $10.00 | |
| | Brass rim | 6.50 | |
| | 20 ornamental tiles for facing | 7.00 | |
| | Soapstone linings | 6.00 | |
| | Moveable iron ash grate | 3.00 | |
| | Labor, setting tiles, &c | 9.00 | 41.50 |
| Parlor Chamber Fire-Place | Parlor chamber hearth | $8.00 | |
| | Facing | 5.00 | |
| | Soapstone linings | 6.00 | |
| | Labor setting | 8.00 | 27.00 |
| Dining Room Chamber Fire-Place | Dining-room chamber hearth | $8.00 | |
| | Marble facings | 7.00 | |
| | Soapstone linings | 6.00 | |
| | Labor setting | 8.00 | 29.00 |
| Library Chamber Fire-Place | Library chamber hearth | $8.00 | |
| | Tile facings | 7.00 | |
| | Brass rim | 6.50 | |
| | Soapstone linings | 6.00 | |
| | Labor setting | 9.00 | 36.50 |
| | Total mason work | | $3135.15 |

* For elevations and details, see *Carpentry and Building* for July, 1882. For specification of materials and labor, see "Star" in October issue for 1882.

**Carpenter and Joiner Work.**

| | | | |
|---|---|---|---|
| Frame. | 4000 ft. pine framing timber in 1st floor, at $35 per M | $140.00 | |
| | 2422 ft. pine framing timber in 2d floor | 84.77 | |
| | 2150 " " " attic | 75.25 | |
| | 2300 " " " outside studding | 80.50 | |
| | 3800 ft. pine framing timber in rafters | 133.00 | |
| | 3000 ft. hemlock studding in partitions, at $20 per M | 60.00 | |
| | 900 ft. hemlock furring strips and sawing | 23.60 | |
| | 75 framing pins | .75 | |
| | Ironwork, strap and bolts | 3.00 | |
| | Nails and spike | 4.00 | |
| | Bridging partitions and joist | 14.50 | |
| | 75 days' work framing and raising, at $3 per day | 225.00 | |
| | Cartage | 19.00 | |
| | Centers for masons | 3.00 | 866.37 |
| Outside Covering. | 4224 ft. sheathing boards, at $15 | $63.36 | |
| | 380 ft. pine finishing lumber, at 5¢ | 19.00 | |
| | 458 yds. sheathing paper | 22.90 | |
| | 4000 ft. clapboards, at $28 per M | 112.00 | |
| | 188 ft. base molding, at 12¢ | 22.56 | |
| | 200 ft. band molding, at 6¢ | 12.00 | |
| | Carved panel, south side | 10.00 | |
| | 13,500 dimension shingles, with sawed ends, at $9 | 121.50 | |
| | 3 casks of nails | 12.00 | |
| | 1 cask of nails for vertical shingles | 6.00 | |
| | 69 days' labor on above | 207.00 | |
| | Cartage | 7.37 | 615.69 |
| Cornice. | 167 ft. in length of rough lumber, at 5¢ per ft | $8.35 | |
| | 167 ft. in length of finishing lumber, at 8¢ | 13.36 | |
| | 167 ft. gutters, at 16¢ | 26.72 | |
| | 167 ft. moldings, per ft., 2¢ | 3.34 | |
| | 167 ft. millwork, " 6¢ | 10.02 | |
| | Nails, 167 ft., at 2¢ | 3.34 | |
| | Labor, 167 ft., at 15¢ (Cost per running ft. complete, 54¢) | 25.05 | 90.18 |
| Roof Covering. | 3433 ft. roof boards, at $15 per M | $51.50 | |
| | 2600 shingles, at $5.50 per M | 143.00 | |
| | 130 lbs. shingle nails | 7.80 | |
| | 116 zinc valleys and flashings, at 10¢ each | 11.60 | |
| | 54 ft. cresting, at 25¢ per ft | 13.50 | |
| | 7 finials, at 75¢ each | 5.25 | |
| | 80 lbs. nails, at 4¢ | 3.20 | |
| | 26 days' labor laying shingles | 78.00 | |
| | 34 days other labor | 102.00 | |
| | Skylight over rear roof | 6.00 | |
| | Louver ventilators | 6.00 | |
| | Cartage | 16.00 | |
| | 46 ft. 4-in. conductors, at 20¢ per ft | 9.20 | |
| | 2 lead goose-necks, 8-lb. lead | 5.12 | 458.17 |
| Gable End Covering. | 80 ft. rough lumber, at $15 | $1.20 | |
| | Ornamental shingle work | 4 80 | |
| | 12 ft. rail | .96 | |
| | 28 ft. barge board | 4.00 | |
| | 20 ft. frieze | 3.00 | |
| | 180 ft. finishing lumber, in planceer, &c. | 9.00 | |
| | Ornamental panel, with date | 2.00 | |
| | 40 ft. lumber in balcony floor | 3.00 | |
| | 2 carved panels for corners | 1.00 | |
| | 8 balusters, 80¢; 8 balusters, 40¢ | 1.20 | |
| | 8 brackets | 4.00 | |
| | Nails | .70 | |
| | Labor not included in above | 12.00 | |
| | Cartage | .50 | |
| | Rear gable and gablet | 12.00 | 59.36 |
| Front Pizza. | 810 ft. pine timber, at 3½¢ per ft | $28.35 | |
| | 2000 ft. finishing lumber, in posts, rails, &c | 100.00 | |
| | 380 ft. rough lumber, at $15 per M | 5.70 | |
| | 180 ft. tumber in cornice work | 9.00 | |
| | 950 ft in flooring and ceiling | 37.92 | |
| | 56 flashing | 5.60 | |
| | 3000 shingles | 16.50 | |
| | Millwork on 12 posts, $1.50 each | 18.00 | |
| | 52 balusters, 10¢ each | 5.20 | |
| | Brackets | .40 | |
| | Cornice blocks | 1.70 | |
| | 94 ft. molding, at 3¢ | 2.82 | |
| | Labor, 20 days | 60.00 | |
| | Cartages | 5.00 | 296.19 |
| Rear Veranda. | 23 running ft. rear verandas, at $5.40 per ft | $124.20 | 124.20 |
| North Porch. | 48 ft. timber | $1.68 | |
| | 30 ft. pine plank | 1.05 | |
| | 180 ft. finishing lumber | 7.20 | |
| | Post, rails and balusters | 7.00 | |
| | 8 lbs. nails | .32 | |
| | 4 brackets | 2.00 | |
| | 2 days' work | 6.00 | 25.25 |
| | Amount forward | | $2535.41 |

| | | | |
|---|---|---|---|
| | Amount brought forward | | $2535.41 |
| Side and Rear Fence. | 43 fence posts, 75¢ each | $32.25 | |
| | 500 ft. finishing lumber, at 4¢ per ft | 20.00 | |
| | 650 pine pickets, at 3¢ each | 19.50 | |
| | 49 lbs. spike and nails, at 4¢ per lb | 1.96 | |
| | 43 post holes | 4.30 | |
| | Cartage | 2.50 | |
| | Labor on fence | 37.50 | 118.01 |
| Clothes-line Posts. | 12 clothes-line posts | $12.00 | |
| | 12 " hooks | 1.44 | |
| | Digging 12 holes | 1.20 | |
| | Setting posts | 1.00 | 15.64 |
| Windows | 43 windows at $9.79 each | $420.97 | |
| | *Analysis of Cost of Average Window.* | | |
| | 30 ft. finishing lumber | $1.50 | |
| | 36 ft. molding, at 3¢ per ft | 1.08 | |
| | Sash | .92 | |
| | Blind trimmings | .50 | |
| | Blinds | 1.32 | |
| | Weights, 60¢; pulleys, 16¢; cord, 8¢; sash-fasts, 15¢ | .99 | |
| | Stop and parting strip | .48 | |
| | Labor | 3.00 | |
| | Total | $9.79 | |
| | Extra on architraves of 16 windows, 1st story | 45.36 | |
| | Extra on sash fasteners | 12.00 | 478.33 |
| | 11 attic windows, at $7 each | $77.00 | |
| | 9 cellar " $4 " | 36 00 | |
| | 22 winter sashes, average $1 each | 22.00 | 135.00 |
| Mosquito Frames. | 56 frames, 30¢ each | $16.80 | |
| | Wire cloth, average 32¢ each | 18.00 | 34.80 |
| Flooring. | 4550 ft. rough flooring, at $15 | $68.25 | |
| | 3900 ft. pine, at $35 | 136.50 | |
| | 1165 S. Y. pine, at 4¢ | 46.60 | |
| | 500 yds. deadening felt | 22.00 | |
| | 250 lbs. nails | 10.00 | |
| | 26 days' labor | 78.00 | |
| | Cartage | 6.00 | 367.35 |
| Front Doors. | 2 doors | $40.00 | |
| | 24 ft. architrave, at 12¢ | 2.88 | |
| | 24 " " at 18¢ | 4.32 | |
| | 6 loose-joint butts, 4 x 4, $2.20 per pair | 6.60 | |
| | 1 lock | 4.00 | |
| | 4 knobs, $1.25 each | 5.00 | |
| | 1 foot bolt | .25 | |
| | 1 top bolt | .30 | |
| | 1 Yale lock | 3.50 | |
| | 1 outside threshold, S. Y. pine | 1.00 | |
| | Labor, casing, hanging and trimming | 6 00 | 73.85 |
| Vestibule Doors. | Vestibule doors, less difference in threshold and Yale lock | $69.85 | |
| | Extra on architrave, 24 ft., at 32¢ per foot | 7.68 | 77.53 |
| Sliding Doors. | 2 doors | $40.00 | |
| | 24 ft. architrave | 12.00 | |
| | Overhead hangers and track | 8.00 | |
| | Full set bronze furniture | 20.00 | |
| | 2 days' labor, casing, &c | 6.00 | 86.00 |
| First Story Doors. | 4 principal doors, 1st story, $43.90 each | $175.60 | 175.60 |
| | *Analysis of Cost.* | | |
| | 1 door | $20.00 | |
| | 22 ft. molded architraves, 50¢ per foot | 11.00 | |
| | 3 loose-joint butts, 4 x 4 | 3.30 | |
| | 1 lock | 2.50 | |
| | 2 knobs | 2.50 | |
| | Labor, $4.00; threshold, 60¢ | 4.60 | |
| | Total | 43.90 | |
| | 28 doors in 1st and 2d stories basement and attic, at $26.90 each | $753.20 | 753.20 |
| | *Analysis of Cost.* | | |
| | Door | $15.00 | |
| | 20 ft. architrave, at 15¢ | 3.00 | |
| | 1 pair of japanned butts | .30 | |
| | 1 lock and latch | 2.50 | |
| | 1 pair knobs | 2.50 | |
| | 1 day casing, hanging and trimming | 3.00 | |
| | 1 threshold and putting down | .60 | |
| | Total | $26.90 | |
| Back Doors. | 2 back-hall entrance doors, at $30.80 each | $71.60 | 71.60 |
| | *Analysis of Cost.* | | |
| | 1 back-hall door, casings, &c | $26.90 | |
| | Additional for lock | 1.00 | |
| | 1 Yale latch | 2 50 | |
| | Difference in thresholds | .40 | |
| | Total | $30.80 | |
| | 38 base knobs, at 7¢ each | $2.66 | 2.66 |
| Mosquito Frame Doors. | 3 doors, at $1.25 each | $3.75 | |
| | 63 ft. wire netting, at 5¢ per ft | 3.15 | |
| | Hinges, knobs and locks | 3.00 | |
| | 1 day's hanging, trimming, &c | 3.00 | 12.90 |
| | Amount forward | | $4937.88 |

| | | | |
|---|---|---|---|
| | Amount brought forward | | $4937.88 |
| | 100 ft. timber | $1.50 | |
| | 50 ft. rough lumber | 1.50 | |
| | 300 ft. finishing lumber, at 6¢ | 18.00 | |
| | 100 ft. molding, at 8¢ | 8.00 | |
| | 1 newell | 20.00 | |
| | 60 ft. molded rail, at 25¢ per ft. | 15.00 | |
| | 30 ft. string board | 15.00 | |
| Main and Attic Stairs. | 38 balusters, long and short, at $1.12 each | 42.56 | |
| | 8 joint bolts | 1.00 | |
| | 15 lbs. nails | .90 | |
| | Glue | .60 | |
| | Brackets and ornaments, middle rail | 14.75 | |
| | 20 balusters, attic stairs, large and small | 22.40 | |
| | Cartage | 6.00 | |
| | Labor, 36 days, at $3.50 per day | 126.00 | 293.21 |
| | 2 flights of back stairs, at $15 each | $30.00 | |
| Back Stairs. | 30 ft. wall rails, stays, and labor putting up rail | 6.30 | 36.30 |
| | 8 ft. of molded rail | $1.90 | |
| | 24 carved balusters | 12.00 | |
| Arch. | 2 brackets | 4.00 | |
| | 20 ft. architrave | 2.40 | |
| | Labor | 6.00 | 26.30 |
| | 99 ft. dining-room dado, at 50¢ per ft. | $49.50 | |
| | 517 ft. hall and second story, at 7¢ | 36.19 | |
| | 107 ft. carved frieze to the above | 26.75 | |
| | 12 days' labor putting up | 36.00 | |
| | 107 ft. cap | 5.35 | |
| Dado. | 68 ft. rake dado up the stairs | 34.00 | |
| | Paneled dado at the foot of stairs | 6.00 | |
| | 108 ft. dado in bath-room | 10.80 | |
| | 24 ft. cap | 1.20 | |
| | 892 ft. in kitchen, laundry, halls, attic, &c. | 89.20 | |
| | 235 ft. cap | 11.75 | 306.74 |
| | 340 ft. molded base, 1st story main and 2d story hall, at 25¢ | $85.00 | |
| Inside Base. | 300 ft. 1 x 9 in. base, at 20¢ | 60.00 | |
| | 300 ft. common base, at 8¢ | 24.00 | 169.00 |
| | 20 ft. rough lumber | $0.40 | |
| Bath Room. | 60 ft. ash lumber in bath-tub and closet finish | 4.20 | |
| | Hinges, screws, &c. | .50 | |
| | 3 days' work | 9.00 | 14.10 |
| | 20 ft. ash | $1.40 | |
| | 30 ft. pine | 1.20 | |
| | Nails and glue | .80 | |
| Toilet Closet. | Brass butts and screws | .35 | |
| | 1 days' work | 3.00 | 6.75 |
| | 4 wash bowls, at $8.55 | $34.20 | 34.20 |

*Analysis of Cost.*

| | |
|---|---|
| 20 ft. ash finishing lumber | $1.20 |
| 30 ft. pine | 1.20 |
| Nails and glue | .15 |
| 2 days' labor | 6.00 |
| Total | $8.55 |

| | | | |
|---|---|---|---|
| | 25 ft. cherry | $2.50 | |
| | 200 ft. pine finishing lumber | 10.00 | |
| | 1 doz. hooks | .25 | |
| | 10 lbs. nails | .50 | |
| Pantries, Preserve and Dish Closets. | 4 lights glass | 8.00 | |
| | 12 ft. brass track, at 50¢ | 6.00 | |
| | 148 sq. ft. zinc lining to dish closet, at 12¢ | 11.76 | |
| | 1 doz. draw-pulls | .60 | |
| | 12 days' work | 36.00 | |
| | 1 door covered with wire netting and trimmings | 4.30 | 79.91 |
| | 125 ft. finishing lumber | $6.25 | |
| Linen Closet. | 4 draw-pulls | .40 | |
| | 2 spring catches | .30 | |
| | 2 pair butts and screws | .25 | |
| | 2 days' work | 6.00 | 13.20 |
| | 400 ft. pine | $16.00 | |
| | 4 doz. wardrobe hooks | 1.00 | |
| Four Closets. | 20 draw-pulls | 2.00 | |
| | 4 cupboard catches | 60 | |
| | Butts and screws | .50 | |
| | 6 days' work | 18.00 | 38.10 |
| | 50 ft. finishing lumber | $2.50 | |
| Medicine Locker. | 3 draw-pulls | .30 | |
| | 1 day's work | 3.00 | 5.80 |
| | 320 ft. pine plank | $12.80 | |
| | 4 iron rod bolts | 2.00 | |
| Tanks. | Hinges, padlocks and screws | 1.00 | |
| | Nails and spike | .50 | |
| | 2 days' work | 6.00 | |
| | Small tank in closet | 4.40 | 26.70 |
| | Amount forward | | $5988.19 |

| | | | |
|---|---|---|---|
| | Amount brought forward | | $5988.19 |
| Pipe Covering. | 100 ft. pine | $5.00 | |
| | 1 day's work | 3.00 | 8.00 |
| Washtub Stands. | 3 turned legs | .75 | |
| | 3 x 3 pine tub rests | .36 | |
| | 1 day's labor setting tubs | 3.00 | 4.11 |
| Tables, &c. | 2 tables and towel rolls | $8.00 | 8.00 |
| | 100 ft. 2d quality pine | $2.50 | |
| Coal Bins. | Nails and spikes | 1.00 | |
| | 1½ days' work | 4.50 | 8.00 |
| | 150 ft. pine | $6.00 | |
| Vegetable Room. | Door trimmings | .50 | |
| | 1 day's work | 3.00 | 9.50 |
| | Parlor mantel | $77.00 | |
| | Library mantel | 68.00 | |
| | Dining-room mantel | 75.00 | |
| Mantels. | Parlor chamber mantel | 77.40 | |
| | Dining-room chamber mantel | 45.00 | |
| | Library chamber mantel | 75.00 | |
| | 4 bracket mantels, at $5 each | 20.00 | 437.40 |
| | Front-door grille in transom | $8.00 | |
| | 9 cellar window guards | 45.00 | |
| | Extra for hinges and padlocks for three windows | 2.00 | |
| Ornamental Iron Work. | 7 wrought-iron finials for roof | 7.00 | |
| | Sun dial | 35.00 | 97.00 |
| | 10 days' labor, finishing not otherwise provided for | $30.30 | 30.30 |
| | 30 cartages not otherwise provided for | $15.00 | 15.00 |
| | Total carpenter and joiner work. | | $6605.50 |

**Plumbing, Gas Fitting and Heating.**

| | | | |
|---|---|---|---|
| | 25 ft. ¾-in. gas pipe, at 7¢ per ft. | $1.75 | |
| | 165 ft. ½-in. gas pipe, at 6¢ per ft. | 9.90 | |
| Gas Fitting. | 187 ft. ⅜-in. gas pipe, at 5¢ per ft. | 9.35 | |
| | 96 fittings | 4.60 | |
| | Labor 2½ days, gas-fitting and testing pipes | 20.00 | 45.60 |
| | 8 bells as specified; average, $4 per bell | $32.00 | |
| | 145 ft tin speaking tubes, with soldered joints and elbows | 5.80 | |
| Bells and Speaking Tubes. | 5 each, porcelain mouth-pieces and tin whistles | 7.50 | |
| | 2 days' labor putting in the above | 7.50 | 52.80 |
| | 1 Blank & Co. furnace and fittings complete | $175.00 | |
| | 50 lbs. 8-in. galvanized iron smoke-pipe | 10.00 | |
| | 126 lbs. galvanized iron cold-air box | 21.00 | |
| | Fittings | 4.75 | |
| | 65 ft. 7-in. round hot-air pipes | 16.25 | |
| | 5 elbows | 2.50 | |
| | 30 ft. 8-in. round hot-air pipes | 9.00 | |
| | 3 elbows | 1.80 | |
| | 8 ft. 10-in. round hot-air pipes | 2.80 | |
| | 1 elbow | .70 | |
| Furnace Work. | 10 furnace collars | 3.00 | |
| | 52 ft. riser pipe, 3½ in. x 10 in. | 15.60 | |
| | 80 ft. iron lath | 16.00 | |
| | tin protection to woodwork around pipes | 2.00 | |
| | 15 tin register-boxes, with frames set in plaster | 8.25 | |
| | Wire netting for register boxes | .75 | |
| | Soapstone linings for register frames | 9.05 | |
| | Three 12 in. x 15 in. enameled registers. One 15 in. x 18 in. " " . Three 8 in. x 10 in. " " . Three 10 in. x 12 in. " " . | 53.67 | |
| | 2½ days' work putting up the furnace work | 12.50 | 364.62 |
| | 60 ft. tarred iron, 1½-in. bore from cistern to tank in attic | $12.00 | |
| Riser to Tank. | Fastenings, couplings and elis | .65 | |
| | 1 day's labor, with helper | 5.00 | 17.65 |
| | 1 Blank's patent single iron force pump | $30.00 | 30.00 |
| | 113 lbs. copper lining in tank | $45.20 | |
| | 15 " solder " " | 3.00 | |
| | 23 ft. ¾-in. 3-lb. lead tell-tale pipe | 5.52 | |
| Water-Tank. | Metal tacks, 45¢; standing overflow pipe and fitting, $1.50 | 1.95 | |
| | 4 days' labor and helper, lining tank and making construction | 20.00 | 75.67 |
| | 100 ft. 4-in. cast-iron soil pipe | $30.00 | |
| | Bends and Y's | 3.25 | |
| Main Soil Pipe. | 34 joints for calking | 5.10 | |
| | Amounts forward | $38.35 | 586.34 |

| | | | |
|---|---|---|---|
| | Amounts brought forward.... | $38.35 | 586.34 |
| | Flashing around roof | 1.45 | |
| | Iron stays and hangers | 3.25 | |
| | 2 ventilating caps | 5.00 | |
| | 4 in. branches for connections | 2.60 | |
| | 2½ days' labor and helper putting in | 12.50 | 63.15 |
| | 1 soapstone sink 22 in. x 42 in. x 6 in. (no back) | $12.00 | |
| | 20 ft. ¾-in., 3 lbs per ft. hot and cold water supply | 4.80 | |
| | Metal tacks, 60¢; solder, 80¢ | 1.40 | |
| | Brass shut-off cocks | 3.50 | |
| Kitchen Sink. | 2 sinks, bibbs | 3.00 | |
| | 3 ft. 1½-in. lead waste, 4 lbs per ft. | .96 | |
| | 1 ft. 6-in. round lead trap, with screw | 2.15 | |
| | 18 joints lead calking | 1.80 | |
| | 58 ft. 2-in. cast-iron vent pipe | 11.60 | |
| | 2 days' labor and helper putting up sink and making connections | 10.00 | 51.21 |
| | Soapstone trays (no backs) 2 ft. x 2 ft. x 1 ft. 3 in. | $27.00 | |
| | 26 ft. ¾-in. 3-lo lead pipe, hot and cold water supply | 6.24 | |
| Laundry Work. | Brass ground cocks | 6.00 | |
| | 10 ft. 1½-in. 4-lb lead waste | 3.20 | |
| | Metal tacks, 60¢; solder, $1.40 | 2.00 | |
| | 1 6-in. round lead trap and screw | 2.15 | |
| | 2 s. s. plug and coupling and chain | 2.75 | |
| | 1½ days' labor on the above | 7.50 | 56.84 |
| | 40-gallon copper boiler | $30.00 | |
| | 1 cast-iron stand | 1.75 | |
| | 1 brass sediment cock | 1.50 | |
| | Finished brass hot-water connections, with range | 4.50 | |
| | 36 ft. ¾-in 3-lb lead cold-water supply | 8.64 | |
| Boiler. | Steam vent and pipe | 3.80 | |
| | 110 ft. circulating pipe, at 24¢ per ft. | 26.40 | |
| | Metal tacks | 1.80 | |
| | Solder | 2.20 | |
| | 1½ days' labor and helper on boiler and connections | 7.50 | 88.09 |
| | 1 planished copper sink, 14 in. x 20 in. x 6 in., oval bottom | $6.00 | |
| | 32 ft. 3-lb. lead, ¾ in., hot and cold water supply | 7.68 | |
| | 2 pitcher cocks | 3.50 | |
| Pantry Sink. | 4 ft. 1-in. overflow | .96 | |
| | 1 lead Bowers trap | 1.50 | |
| | 5 lbs. solder | 1.00 | |
| | 16 ft. 1½-in. ventilation pipe | 5.12 | |
| | Metal tacks, 60¢; plug, chain, &c. | 1.85 | |
| | 1 day's labor and helper | 5.00 | 32.61 |
| | 1 Tucker's flushing-rim hopper, with enameled trap; No. 2 waste-preventing cistern | $30.50 | |
| | 104 lbs. 2-in. 4-lb. lead to supply cistern and hopper | 8.32 | |
| Water Closet in Toilet Room. | 32 ft. 2-in. iron vent-pipe, with ventilating cop | 6.40 | |
| | Lead calking and flashing around pipe at roof | 1.40 | |
| | Metal tacks, $1.50; solder, $2.40; screws, &c., 50¢ | 4.40 | |
| | 13 ft. zinc-lined troughs for supply pipes. | .91 | |
| | 14 ¾-in. tell-tale pipe | 3.36 | |
| | 2½ days' work and helper on water-closet work | 12.50 | 67.79 |
| | 4 Wedgwood marbled bowls, 14 in. diam. | $3.80 | |
| | 42 ft. Tennessee marble slabs, back and side pieces, $2.50 per ft. | 105.00 | |
| | Silver-plated screws | .80 | |
| | 89 ft. ¾-in. 3-lb. lead hot and cold water supply | 21.36 | |
| | 8½ in. swing cocks | 16.00 | |
| | 4 sets couplings, fittings, chains, &c | 5.40 | |
| Wash Bowls. | 33 ft. 1½-in. waste from bowl and overflow to vent-pipe | 10.56 | |
| | 4 2-in. Bowers lead traps | 8.00 | |
| | Safes under water-closets and bowls | 7.50 | |
| | 28 ft. 2-in. iron waste-pipe | 5.60 | |
| | Calking lead, joints | 3.30 | |
| | 6 ft. zinc-lined trough, 42¢; 30 ft. ¾-in. tell-tale pipe, $7.20 | 7.62 | |
| | Metal tacks, solder, &c., $4.60; 20 ft. 2-in. iron vent-pipe, $4 | 8.60 | |
| | Lead calking and flashing, $2.20; 4 days' labor and helper, $20 | 22.50 | 225.74 |
| | 1 Demarest closet, oval, short flushing rim | $12.00 | |
| Bath-Room. Water Closet. | 4-in. cast lead trap | 4.50 | |
| | 16 ft. 3-in. iron ventilating pipe with cap. | 4.00 | |
| | Lead calking, and lead flashing around roof | 1.80 | |
| | Amounts forward.... | $22.30 | 1171.77 |

| | | | |
|---|---|---|---|
| | Amounts brought forward.... | $22.30 | 1171.77 |
| | Lead trap under closet | 1.75 | |
| | 14 ft. ¾-in. tell-tale pipe | 4.96 | |
| | Planed Vermont slate under seat | 2.75 | |
| | Tank lined with 14-oz. copper | 7.50 | |
| | Iron service box | 2.50 | |
| | 8 ft. delivery pipe, 4 lbs. per foot, from service box to flushing rim | 2.56 | |
| | Plated pulls and cups, ball cock, levers, &c | 8.25 | |
| | 24 ft. ¾-in. lead cold water supply | 5.76 | |
| | Metal tacks, solder, &c. | 3.20 | |
| | 14 ft. zinc-lined trough for supply pipe | .98 | |
| | 4 days' work and helper on water-closet work | 20.00 | 82.51 |
| | 1 5-ft. best quality bath-tub | $19.75 | |
| | 20 ft. ¾-in. 3-lb. lead hot and cold water supply | 4.80 | |
| | 2 ¾-in. ground cocks | 4.50 | |
| | Plug, coupling, chains, &c. | 1.25 | |
| Bath-Room. Tub. | 5 ft. 1½-in. 4-lb. lead waste to soil pipe | 1.60 | |
| | 2 ft. 1-in. 3-lb. lead from overflow | .48 | |
| | 1 Bowers trap | 2.00 | |
| | 6 ft. 1½-in. lead vent to iron vent | 1.92 | |
| | Metal tacks, solder, &c. | 2.60 | |
| | 1½ days' work and helper on bath-tub work | 7.50 | 46.40 |
| | Testing pipe 1 day, with helper | 5.00 | 5.00 |
| | Total plumbing work | | = $1305.68 |

### Painting and Glazing.

| | | | |
|---|---|---|---|
| | Glass and glazing, 1st story | $39.89 | |
| | " " " 2d " | 32.90 | |
| Windows. | " " " attic | 7.10 | |
| | " " " cellar windows | 3.60 | |
| Winter Sashes. | " " " winter sashes | 35.91 | 119.40 |
| Front and Vestibule. | 2 transom lights, cathedral glass, | $12.00 | |
| | 2 panels, front doors " | 13.00 | 25.00 |
| | 243 yds. surface clapboarding, at 15¢ per yd | $36.45 | |
| | 182 " " piazzas, &c., at 15¢ " | 27.30 | |
| | 246 " " vert'l shing. at 18¢ " | 44.28 | |
| Painting Exterior. | 44 pairs of single blinds, at $1 per pair, 3 coats | 44.00 | |
| | 383 yds. roof shingles, at 16¢ per yd. | 61.28 | |
| | 22 winter sashes, 50¢ each | 11.00 | |
| | 100 yds. brickwork, oiled, one coat, at 9¢ per yd | 9.00 | |
| | Door and mosquito frames | 4.80 | 238.11 |
| | 1 side of 4 doors, casings and windows, 3 coats white shellac | $14.33 | |
| | 18 yds. in dado, 3 coats white shellac | 13.40 | |
| Dining-Room. | 70 ft. line border | 14.00 | |
| | 31 yds. ceiling in distemper | 2.17 | |
| | 70 ft. in length polished-ash picture mold, 10¢ | 7.00 | |
| | 1 mantel, 3 coats white shellac | 5.00 | 55.90 |
| | 1 side of 1 door, window casing and base | $10.00 | |
| | 1 mantel | 8.00 | |
| Parlor. | 33 yds distemper in ceiling, &c., at 7¢ | 2.31 | |
| | 70 ft. stencil border, at 20¢ | 14.00 | |
| | 70 ft. 1½-in. gilded molding, at 12¢ | 8.40 | 42.71 |
| | 1 side of 3 doors, casing, &c. | $10.55 | |
| | Windows and base | 16.00 | |
| Library. | 1 mantel | 6.00 | |
| | 33 yds. ceiling | 2.31 | |
| | 80 ft. stencil border | 16.00 | |
| | 80 ft. polished-ash picture mold, at 10¢ | 8.00 | 58.86 |
| | 3 yds. dado | $2.25 | |
| | 3 " ceiling, distemper | .21 | |
| | Doors and transoms | 8.00 | 10.46 |
| | 1 side 5 doors, casings, &c. | $9.25 | |
| First and Second Story Halls. | 63 yds. dado, at 75¢ per yd | 47.25 | |
| | 27 yds. ceiling | 1.89 | |
| | 106 ft. line border | 21.20 | |
| | 90 ft. 1½ gilded picture mold | 10.80 | 90.39 |
| Main and Attic Stairs. | Oiling risers and steps | $2 00 | |
| | Rail and balusters, &c., in shellac | 24.00 | 26.00 |
| Toilet Rooms. | Toilet-room, rear hall and stairs | $25.00 | 25.00 |
| Kitchen Pantry. | Pantry | $8.00 | 8.00 |
| Butler's Pantry. | Preserve closet, &c. | $18.68 | 18.68 |
| Kitchen. | Kitchen—Dado, doors and windows, oiling floors, &c. | $25.00 | 25.00 |
| Chamber over Library and Closets. | Doors, windows and base | $15.00 | |
| | Mantel and seats | 7.00 | |
| | 65 ft. 1½-in. ebony picture mold | 6.50 | 28.50 |
| | Amount forward | | $772.01 |

| | | | |
|---|---|---|---|
| | Amount brought forward | | $772.01 |
| Chamber over Library and Closets. | Doors, windows and base | $19.00 | |
| | Wash-bowl and mantel | 6.75 | |
| | 65 ft. ebonized picture mold | 6.50 | 32.25 |
| Chamber over Dining-Room & Closets. | Doors, windows and base | $11.40 | |
| | Mantel | 5.00 | |
| | 70 ft, ebonized picture mold | 7.00 | 23.40 |
| | Aleove, linen closet and back hall, &c | $19.25 | 19.25 |
| Bath-Room and Second Story Hall | Doors | $9.10 | |
| | Dado, tubs, closet and tank | 9.00 | |
| | Base, &c | 3.00 | 21.10 |
| Laundry. | 15 yds. dado | $7.50 | |
| | Windows and inside blinds | 4 00 | |
| | Doors | 1.50 | |
| | Oiling S. y. pino floor | 2.32 | 15.32 |
| | Amount forward | | $883.33 |

| | | | |
|---|---|---|---|
| | Amount brought forward | | $883.33 |
| | Oiling stairs and floor | $1.25 | |
| Basement Hall and Cellar. | Doors | 3.60 | |
| | Dado, window and base and painting in cellar | 10.00 | 14.85 |
| Attic Rooms. | Dado in billiard and play room | $26.00 | |
| | Windows and inside blinds | 4.00 | |
| | Doors | 3.00 | 33.00 |
| | Total of painting | | $931.18 |

**Recapitulation.**

| | |
|---|---|
| Mason work | $3,135.15 |
| Carpentor and Joiuer work | 6,605.50 |
| Plumbing, Gas Fitting and Heating | 1,305.68 |
| Painting and Glazing | 931.18 |
| Total, including builder's profit | $11,977.51 |

## CORRESPONDENCE.

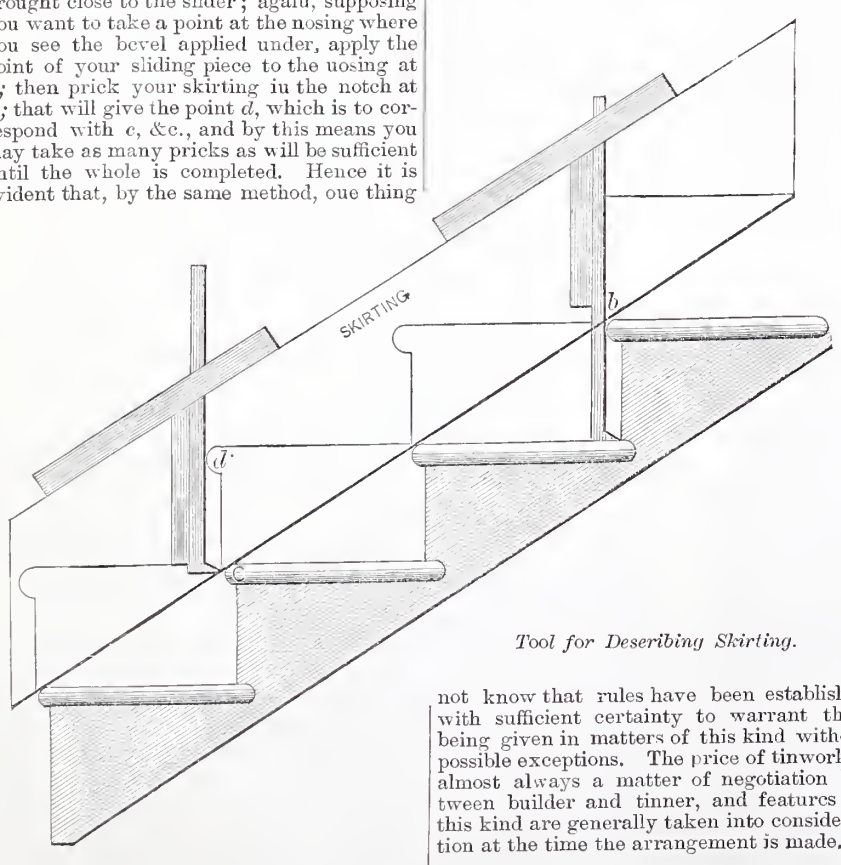
### Tool for Describing Skirting.

*From* J. C. C., *Jacksonville, Ill.*—I note the inquiry for a tool for describing the skirting of staircases in a recent issue of *Carpentry and Building*. I inclose a tracing which is taken direct from plate No. 73 of "Peter Nicholson's Carpenter's Guide." I presume the drawing will be self-explanatory, and I suggest that the author's description would be well to accompany it. In conclusion, I would say that this is no new tool, as the book from which I took it was published as long ago as 1830.

"In the cut is shown a bevel made to the rake of the skirtiug and the other perpendicular to the stair, and a sliding piece to be applied to the perpendicular side of the bevel with a hooked point of iron or steel, to stand forward at the bottom so much that the sliding piece may clear the nosing of the step. I shall proceed to show its application. Lay the skirting over the top of the steps and let a very fiue notch be made on the front edge of your sliding piece to the hight of a step or rather higher; then apply the point of the sliding piece to the internal corner of a step and prick your skirting iu the notch *b*, the bevel being supposed to be brought close to the slider; agaiu, supposing you want to take a point at the nosing where you see the bevel applied under, apply the point of your sliding piece to the uosing at *c*; then prick your skirting iu the notch at *d*; that will give the point *d*, which is to correspond with *c*, &c., and by this means you may take as many pricks as will be sufficient until the whole is completed. Hence it is evident that, by the same method, oue thing may be fitted to another whether it is considered as a staircase or not, standing either raking, horizontal or perpendicular.

If the steps of a staircase be very true, two pricks from each riser and tread will be sufficient, as it is only joining these pricks by lines which will form the rise aud tread of each step, and three pricks in each nose, because a circle may easily be drawn through three points. If the nosings are all exact, let a mold be made to fit one of them, and your nosings on the skirtiugs be drawn by this mold, which will likewise be exact."

*Note.*—We have a letter on this same subject from H. C., Evershot, Dorsetshire, England, calling attention to exactly the same tool aud presenting a similar description. We have inserted the account given by Peter Nicholson, as our correspondent above suggests, for we presume the book is not in general circulation among our readers.




*Tool for Deseribing Skirting.*

### Measuring Tin Roofs.

*From* S. H., *Pottsville, Pa.*—Please give me the exact rule for measuring tin roofing with regard to skylights and ventilators occurring in roofs.

*Answer.*—The usual custom in measuring work of this kind, where the openings are small, is to measure the roof as though it were solid, and where there is an extra amount of labor in flashing and other finish around the openings, to add arbitrarily for it. Where the openings are large the net saving in material is sometimes deducted, and a charge is made for the extra work in flashing and finishiug around the same. We do not know that rules have been established with sufficient certainty to warrant their being given in matters of this kind without possible exceptions. The price of tinwork is almost always a matter of negotiation between builder and tinner, and features of this kind are generally taken into consideration at the time the arrangement is made.

### Material for Gutters.

*From* G. B. B. & Son, *Greenville, S. C.*—A new and substantial church building which is to be covered with slate is being erected in this place. There will be about 100 feet of gutter in boxing under eve required in connection with this church roof. A portion of the roof will have uo gutter whatever. The gutter, as specified by the architect, is 8 inches on the bottom and 4 inches deep. We desiro assistauce in the selection of the metal with which to line the gutters in question. The gutters occur in sections about 12 feet long and less. Would you advise using heavy-coated tin, best galvanized iron or 16-ounce copper, or is there some other metal better than any of these adapted to our purposes? We desire something that will last over 100 years. Our architect recommends galvanized iron for the purpose, but we feel free to set aside his specification in favor of any more durable metal.

*Answer.*—We cannot agree with the architect that galvanized irou is the best material to use under the circumstances. We think that well-coated tin plate would be better than it. However, the material *par excellence* for the purpose, iu all probability, is copper, provided always it is properly laid. Just how it should be managed depends somewhat upou details of construction with which our correspondeut has uot furuished us. On general principles the lengths should be left free to contract and expand, both longitudinally and across their width. The connections with the down spouts should also be carefully managed, so that the action of heat and cold may not serve to crack the joints in a way to make a leak. Locks and double seams are to be preferred to solder, although the latter may bo applied to make the joints entirely tight. The outer edgo of the gutter, in fastening against the cornice boards, can be held in place by some means better than that of nailing, which is the usual plan resorted to. Copper roofs and gutters are in existence which have endured nearly as long as the period mentioned by our correspondent, and we think, by proper construction, that his committee can put gutters into the church in question that will last at least until the present generation have ceased managing its temporal affairs.

### Blank for Estimating

*From* W. G. M., *Warrensburg, Mo.*—I have a form for estimating the cost of materials and labor for any house, which I submit to the readers of *Carpentry and Building*. It gives marginal references of specification, also the number of page, quantities, cost of the same, amount of labor, cost of same, and the total cost of quantities and labor; also remarks and analysis, allowing ample space for each heading. This form gives the cost of material and labor separately, and only the actual cost. Builder's profit is not included in it, but is added as a separate item at the close of the estimate. Items such as doors, sash, hardware, &c., which labor has produced out of the raw material and which are sold by the piece, are put in quantities, and labor that is put on the building in course of erection aud also in the shop is put in the labor heading. I submit the form for criticism and improvement.

*Note.*—The form that our correspondent sends was drawn one-half full size. The dimensions of the several columns appear upon his sketch. Inasmuch as we cannot set it up in type as large eveu as he drew it, we have allowed the dimensions to appear, in order to indicate the proportions of the different parts in the original. We think the form is

well adapted for the purpose, although no doubt some of our readers will consider that there is too much paper and too much machinery to employ in making an ordinary estimate. In reply to all such we have simply this remark to make: If every one would take as much pains with his estimates as the use of this form anticipates, there would be fewer mistakes made, less jobs taken too low and less irresponsible men in the building business. Our correspondent says that he offers this form for criticism and inspection; we trust, therefore, that our readers will give it such attention as it deserves, and if any improvements can be suggested, we hope, for the benefit of all our readers, they will be forthcoming.

1 in.

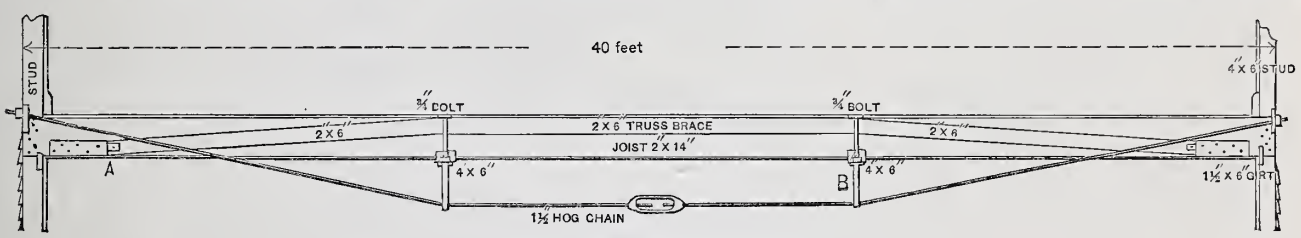
| Items named in margin of specification. | Page. | Quantities of materials. | Amount of cost. | Amount of labor. | Amount of cost. | Total cost. | Remarks and analysis. |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| ←2½ in.→ | | ←4 in.→ | | ←2 in.→ | | ←1¼ in.→ | |
| | ←¾ in.→ | | ←1¼ in.→ | | ←1¼ in.→ | | ←4 in.→ |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

*Blank Form of Estimate, Submitted by W. G. M.*

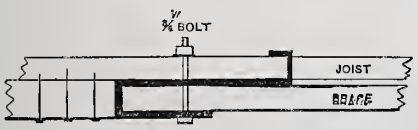
### Trussing a Floor.

*From* J. M. J., *Summit, Miss.*—There is a two-story frame house in this vicinity, 40 x 100 feet in size, without partitions in either first or second story. The frame is of the balloon style, of 2 x 6 studding, doubled at all openings and placed 16 inches between centers. The first story is 16 feet in the clear, sealed; the second story 15 feet in the clear, plastered. The second-story joists are 2 x 14 inches, 40 feet long, placed 16 inches between centers. The ends rest on a girt 1½ x 6 inches, which is let into the studding. The ends of the joist are spiked to the studding. I want to know how the second-story floor can be held up and kept from vibrating or swinging without posts being used in either first or second story. Can the floor be supported in such a way as not to show the timber work or supports below the first-story ceiling? That is, can a truss be made between the ceiling of the first story and the floor of the second story—the space being 14 inches—strong enough to support the floor? At present the floors are supported by two braces like the inclosed diagram, about 10 feet apart; also 1½-inch hog-chains, 20 feet apart, the ends fastened to the outside of the wall by an iron plate to the 4 x 6 window studs at the top edge of the joist, which show about 18 inches below the first-story ceiling. At present the floor swings and goes in waves from one end to the other whenever a man stands in the middle and makes an effort to shake it. The first story of the building is used as a skating rink, and the second floor is used by a society consisting of from 40 to 50 members. I would like very much to see some designs or methods of holding or trussing such floors from the readers of *Carpentry and Building*. I think such would be of interest to others as well as myself.

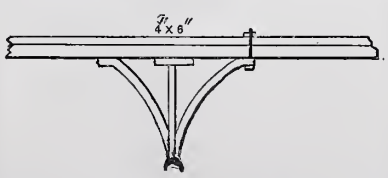
*Note.*—We have engraved the sketch accompanying our correspondent's letter above, showing how the floor is at present sustained. We think he has got a very difficult problem to contend with; not that a floor of 40 feet span cannot be sustained, but that the framework itself upon which this floor rests is of insufficient stability to admit of the floor being held rigidly in place. Balloon-framing requires careful bracing, and strength derived from partitions to present a substantial structure. These conditions seem to be entirely lacking in the case cited, and we doubt not that some of our readers will suggest that it will be as well to commence anew as to attempt doctoring a building of the kind described. However, something can undoubtedly be done that will be a help under the circumstances and that will make the floor better than it is at present. One remedy that suggests itself would be to introduce an additional joist in each space between joists at present. Another plan would be to put a truss brace on the side of each joist. These should be firmly spiked in place and should be upon alternate sides of the joist in course. Not less than four rows of good bridging should be employed in stiffening the joists in the opposite direction. We think it very likely that a plan of bracing and stiffening in this manner, carefully carried out, is preferable to using that of additional joists, as first suggested. Our correspondent desired this question to be referred to our readers; accordingly, we request them in his interest, and for the benefit of all our readers who may have occasion to do work of this general character, to forward such replies as their own experience may suggest will be of advantage.




*Trussing a Floor.—Diagram Accompanying Letter from J. M. J.*




*Detail of Construction at A.*




*Side View of Bracket Supporting Hog Chain at B.*

### Passage Through the Pantry.

*From* PHOTO, *Buffalo, N. Y.*—I would like to say a few words in defense of the passage through the pantry, which of late seems to have been the subject of considerable adverse criticism. The arrangement suggested by your correspondent J. M., in the July issue, would be more convenient, perhaps, but it would also result in allowing the odors from the kitchen to pass to all portions of the house. This might not be objectionable in the localities from whence the criticisms proceed, but Eastern architects, as a rule, have to provide against such contingencies, and the annoyance can be prevented only by having at least two doors between kitchen and dining-room. The space between the doors should have communication with the outer air, as without ventilation of this space the precaution of double doors would be useless. Direct communication between dining-room and kitchen is rarely absolutely necessary in the performance of household duties, especially when a slide is provided through a china closet. The traffic through the pantry need not be general when there is indirect communication between the kitchen and hall.

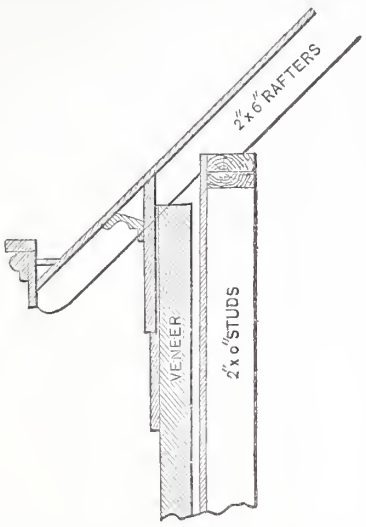
### Projection of Cornices.

*From* J. B., *Des Moines, Iowa.*—In a recent number S. E. M., of Cookport, Pa., in answer to M. T., of Dorchester, asserted that there is no rule governing the width of cornices. I beg to differ with him, and offer for the consideration of the readers of *Carpentry and Building* a rule that was given me many years since by a man for whom I was working. Divide the hight of the building into 12 equal parts; use one part for the projection of the cornice, and one part for the top of the frieze. Make the depth of fascia and crown molding together equal to three-eighths of one part. Of this part one-third of the top should belong to the fascia and two-thirds to the crown molding.

### Veneered Buildings.

*From* B², *St. Paul, Minn.*—Answering the inquiry of the correspondent from Little Rock, Ark., I would say that in veneered structures the building is framed in the style known as balloon framing, now general in various sections of the country. It does not make any great difference, however, how the building is framed. The studding, 2 x 6 inches, is set 16 inches between centers, and

is sheathed up on the outside with matched fencing. Common boards are not ordinarily used, because only the better class of houses are veneered. The matched fencing is covered with roofing felt or tarred paper, stayed with lath over the seams. So far the building is similar to an ordinary frame house. Then comes the 4-inch veneering, leaving 1 inch between it and the sheathing for the easy manipulation of the brick. The




*Veneered Buildings.—Fig. 1.—Section Through Upper Part of Wall, by B².*

brick veneering is started either directly over the foundation or from a stone water table resting on stonework. The brickwork is carried up similar to veneering of solid brick walls, and is anchored to the framework of the building by spikes driven into every stud every sixth or seventh course in hight. No particular attention is given to the matter of ventilating the air space, which, however, is allowed to open between the rafters or directly into the attic of the building, especially when the latter is left unfinished. The studs have a plate on top, to which the rafters of the building are secured in a manner similar to that in ordinary frame structures. If the face of veneering is to set flush with the foundation wall, as is generally the case, the outside face of stud will set 6 inches back of the face of foundation walls, as may be seen by the accompanying sketch. The window and door

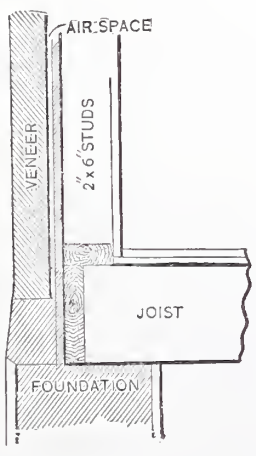



*Fig. 2.—Section Near Floor Line, Accompanying Letter From B².*

frames on the outside are, of course, finished as though the structure were of solid brick.

As to the cost of the building, there is no material difference between this and one of solid brick, since the greater cost of laying up the 4-inch veneering in place of the solid wall counterbalances what is saved in other directions. A veneered house is fully as warm in itself as a solid brick house, while it is almost, if not entirely, free from the dampness incident to brick structures, and which is known to be dangerous in newly-built houses. On the other hand, veneered houses are not quite as substantial as those built entirely of brick. In case of destruction by fire the walls of a solid brick house may be saved, while the brickwork of a veneered house will be lost.

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*From G. B., Rutherford, N. Y.*—I have had considerable experience with veneered buildings, especially while living in Canada. I consider this construction very desirable, resulting in a warm house in winter, and withal an edifice that is likely to be durable if well constructed. The houses are built as follows: In the first place, the cellar wall is made wide enough to project 6 inches outside of the frame. The frame is then boarded up with rough lumber or matched inch stuff, leaving 5 inches of wall. The openings for doors and windows are then cut through the sheeting and the frames are made ready, being prepared according to the sketch, Fig. 3. The frames are inserted and nailed securely in place, the same as in a frame building. The brickwork is then started on the edge of the foundation wall, leaving a space of 1 inch between the wall and frame. Some builders fill this space with grouting. Others leave it for ventilation. I prefer the first method of construction. In fastening the wall to the frame 6-inch cut spikes are used. These are first annealed by being placed in a pile and a fire started over them. Then as the brick is laid, in the seventh to ninth course, according to the judgment of the bricklayer, for a heading course a spike is driven into each stud. Where studs are not convenient, the spikes are driven into the boards, in which case they can be bent down on the inside or clinched. The work is continued in this manner until completion. In Canada the brick used are pressed with a cavity in the center ¼ inch deep, which will receive the

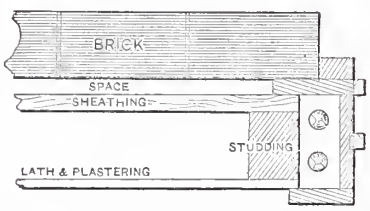


*Fig. 3.—Window Construction, from G. B.*

head of the spike in the process of anchoring just described. Care should be taken to drive the spike far enough to take hold of the brick, so as to give the brick no chance to move after the mortar is set. In building the chimney, the outside wall forms one side of the chimney. I trust this description will be of benefit to the reader who asked the question.

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*From C., New York.*—The frame or veneered building is constructed in the ordinary balloon style, and if sheathed may, for great stiffness, have the sheathing run diagonally in reverse directions for each half. If not sheathed, which is sometimes the case, the frame itself should be thoroughly braced. Anchors for the brickwork are 20-penny nails driven into the sheathing or stud about half way, and placed so as to come just on top of the brick. They are so calculated that when the next brick is bedded in mortar half of the 20-penny nail and its head are firmly imbedded. The nails should be driven about 4 feet apart horizontally, and breaking joints every course as the work goes up. When no sheathing is used it is a good plan to plaster one rough scratch coat on the inside of the bricks after the building is completed, which insures a tight air chamber between it and the lath and plaster. The best mortar for the brickwork of veneered buildings has one-quarter cement in its composition. The foundations of the building need be no different than if for an ordinary frame or brick house with walls 8 inches thick. A stone water table may be employed or not, as circumstances determine. Windows and doors may be arched if desired. It is preferable to arch them in place of using stone lintels, as the stone is more difficult to anchor to the frame. Wooden sills, pine or hemlock, dressed and painted two coats, in sand finish, are sometimes employed. They last very well indeed. The shrinkage of the frame and the settling of the mortar joints of the brickwork are very nearly equal, especially if the timbers are not well seasoned, so that on that score the somewhat

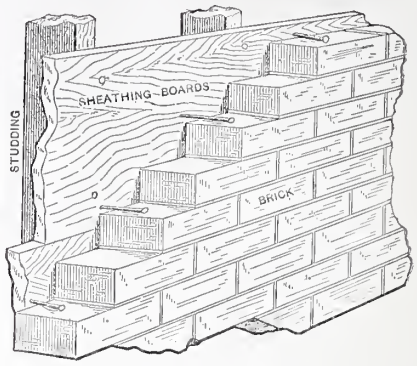


*Fig. 4.—Perspective View of Portion of a Veneered Wall, by C.*

odd union of materials is equalized. There will be no trouble about the brickwork settling away from the frame if nails or anchors are freely used. By placing the wall plate so that it does not quite cover the studding, or by carrying the plate above the ceiling, ample chance for ventilation is provided.

The cost of a structure of this kind, compared with others, is altogether another matter, and I regret that I cannot give exact information. In places where this style of building is common and well understood by the builders it is cheaper than an 8-inch brick wall, but where it is new to mechanics it is easily made to cost more than 12-inch brick walls. In our steady land these houses last very well, but they are not to be recommended for any country that has the shakes.

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*From V. T., Boone, Iowa.*—In the April number of *Carpentry and Building*, page 82, I gave my experience with veneered buildings. I will at the present time give my further observations in the same direction. During the heavy rain storms of the past spring I gave particular attention to a veneered building that I had completed and plastered last fall. The brick soon became so saturated with water that they could contain no more. The wooden walls inside of the brick became so wet that the plastering of the building was in many places wet through. This satisfied me what the trouble was with the rotten walls mentioned in the April number. I am at present veneering a building and taking the precaution to use tarred paper between the brick and wooden walls. This I think I am safe in recommending as a partial preventative against dampness, while it certainly will add to the warmth of the house. From my limited ex-

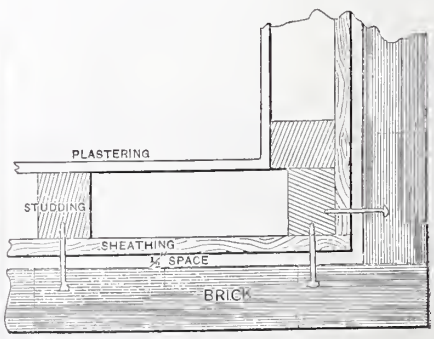


*Fig. 5.—Plan Showing Construction of Corner, by C.*

perience in work of this kind, I am free to say that I am not pleased with veneered buildings.

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### Deadening Floors.

*From B², St Paul, Minn.*—In response to M. A. C., Richmond, Ind., who inquires with reference to deadening floors, I would advise him to try lime and sawdust well mixed together, and put in in the following manner. Nail cleats on each side of the joist 5 inches

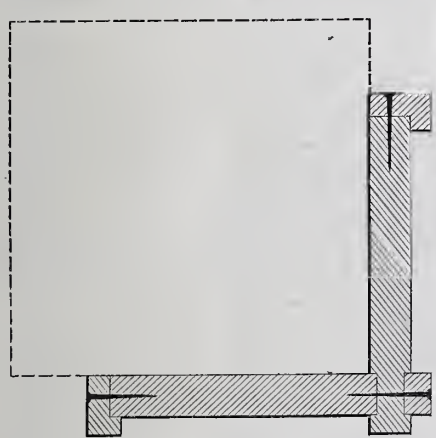
below the top, and on this lay common boards. Then put in the mixture of lime and sawdust 3 inches thick. The sawdust will act as a deadening material, and the lime will protect from vermin.

### Siding Gauge

*From* J. B., *Des Moines, Iowa.*—In reply to the inquiry of J. H., Memphis, Tenn., I would say that a siding gauge of the kind he requires, known as Nester's patent siding hook, is in the market. It serves the purpose of gauging, leveling and marking siding ready for sawing. I do not know where it is manufac ured.

### Corner Boards of Buildings

*From* R. F. B., *Oskaloosa, Iowa.*—As it is desirable to arrive at the best possible way of constructing woodwork in the line of carpentry so that it will be neat and durable, I will submit my plan for constructing corner boards of buildings, for the consideration of the many readers of *Carpentry and Building.* The method employed will be readily understood from an inspection of the accompanying engraving. I use a ⅞-inch bit in the plow for making the groove. This bit I had made to order for the purpose. The corner consists of five pieces, as shown in the sketch. It will be seen that the joints



*Corner Boards of Buildings.—Diagram Accompanying Communication from R. F. B.*

are not exposed to the weather, as in ordinary construction. The parts are joined by nailing, as clearly shown.

### Paint for Tin Roofs.

*From* A. P., *Zanesville, Ohio.*—With reference to paint for tin roofs, I desire to say that coal tar, or any other tar, is positively injurious to metal roofs of all descriptions save copper. My experience with the so-called vulcanized rubber paint is this. Being a practical mechanic, a few years since I was asked to engage with a company for the express purpose of painting tin and other roofs with vulcanized rubber paint said to be fire-proof, which it really was when properly prepared. It was not fire-proof, however, as commonly prepared by the traveling agent passing through the country and doing such work. As I was a tinsmith, my duty was to see that all tin roofs were made perfectly tight before applying any paint. While in this business I was frequently called upon to repair roofs that had been painted with coal tar. I invariably found the tin under the paint the same as narrated by J. H.—all eaten away by the tar coating. Some few roofs of this kind I repaired as best I could, while with others I was compelled to recommend a new roof entire. The vulcanized rubber paint was composed of such materials as were well calculated to protect the metal if the paint was prepared according to the receipt, which was as follows: The base, or bulk, was pine or coal tar, 1 gallon; asphaltum, 4 pounds; metallic brown, 4 pounds; alum, 8 ounces; Spanish whiting, 1½ pounds; raw rubber dissolved in alcohol, 2 ounces. It was prepared in this manner: The tar, generally coal tar, was brought to the boiling point, when the asphaltum was added and boiled until dissolved; then the alum in powder was allowed to dissolve in the same. The mixture was then taken from over the fire and the whiting and metallic brown were added while it was still hot. After being put in other vessels we added the dissolved rubber prepared beforchand. This ended the mixing. When being applied we added more brown mixed with naphtha as the case required. This proved to be a fire-proof paint and lasted on furnace stacks for three seasons and on mill stacks still longer. The cost per gallon was about 83 cents when made in ten-gallon lots. It takes from three to eight days to dissolve the rubber. Paint composed as above described was the vulcanized rubber paint, so-called. But it was so expensive that we could not compete with tar or asphaltum companies, so we were finally obliged to give up to them.

My test of the paint was this: I applied two coats of it to a pine shingle on one side and edge, and one coat to the other side, allowing one edge and an end to be free from paint. I then held it in the fire until the wood caught, then threw it in the fire and had the satisfaction of seeing the shingle burn out between the layers of paint, leaving nothing but two thin crusts of paint looking something like scales of rust laying in the fire. As to the smell of this paint, we claimed that it was beneficial, inasmuch as it warded off such complaints as diphtheria and other throat troubles. We advocate that it should be used yearly as a sanitary measure in all large cities troubled miasmatically. As a paint for shingle roofs I believe it has no equal. It makes a surface as hard as metal and one that is proof against small sparks of fire and as smooth as glass I would that we could induce more to paint the most exposed parts of their houses—namely, the roofs—with a material as good as this.

### Mitering a Raking Mold With a Level Mold.

*From* H. A. O., *Scotts, Mich.*—In answer to the inquiry of A. M F., Tilden, Tex., concerning the method of mitering a raking

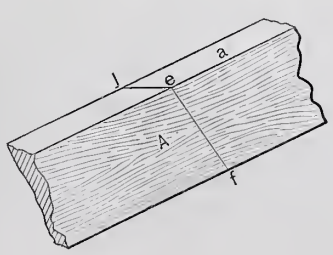
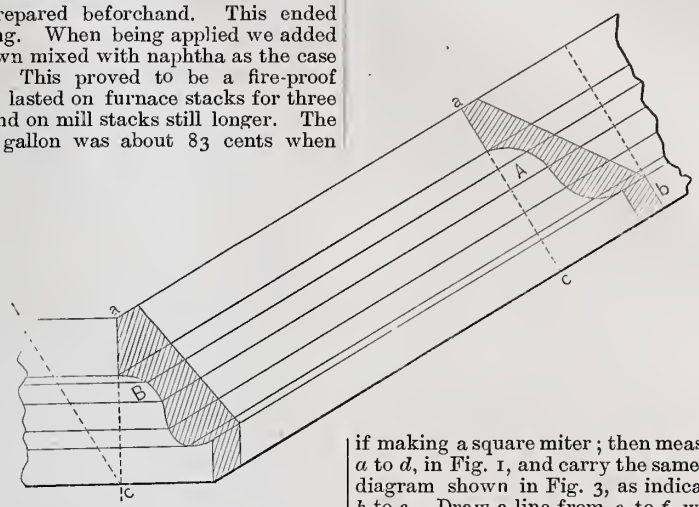



*Fig. 2.—Back of A in the Preceding Diagram, Looking at it from Above.*

mold with a level mold, I offer the following: First get the rake of mold as shown in Fig. 1 of the accompanying sketches: A being the raking mold, B being the level mold, the same being thrust forward two inches from the face board. In Fig. 2, A is shown from the back, looking down. This figure is introduced to show how the same is mitered. Fig. 3 represents A from the back, looking horizontally. B, in Fig. 1, can be mitered in a miter box, but A cannot be so cut without trouble. To miter A, in Fig. 3, take the steel square and place the bevel of the rake, which in this case is ⅓ pitch, from *f* to *i*, then take the try-square and draw from *f* to *g* a line as shown. Measure from *g* to *h* as




*Mitering a Raking Mold with a Level Mold.—Fig. 1.—Problem Stated Showing the Difference in Profile Between Raking and Level Molds.*

if making a square miter; then measure from *a* to *d*, in Fig. 1, and carry the same on to the diagram shown in Fig. 3, as indicated from *h* to *e*. Draw a line from *e* to *f*, which will give the bevel on the back of A, Fig. 1. Fig. 2 is very nearly the same as Fig. 3, only the member *a* is shown on which to place a true miter from *e* to *j*. This done, draw a line from *e* to *f*, as shown in both figures. All this can be done with the try-square and rule. B, in Fig. 1, of course, must be of a different profile from A, since otherwise the two will not miter. After the line is laid on the back

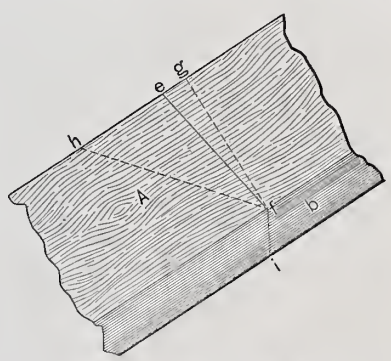



*Fig. 3.—The Back of A, Viewed Horizontally.*

of the mold A, as above given, then saw to the line as close as possible. A close joint will be obtained every time.

### Criticisms on the Third Prize Estimate.

*From* V., *Iowa.*—I am taking much interest in the publication of the prize estimates. I am glad that the correspondence department is open to criticisms, for there will be a number of points brought out that I think will be of advantage to readers in general. Great allowances should, of course, be made for the different methods in use in different parts of the country. To a Western man, some of the methods employed by Mr. Bechtel in the third prize estimate seem very novel. For the benefit of young men in the great West who are forming habits of estimating, I offer a few remarks. In estimating the cost of brickwork, Mr. Bechtel says to deduct openings. He further asserts that one man will tend four masons on rough work, each mason laying 1000 bricks per day. He further estimates the extra on face-work laid in red mortar as follows:

| | |
|---|---|
| Extra time in laying per thousand..... | $1.20 |
| 1000 brick, 70 loads, at 2½ cents..... | 1.75 |
| Total cost..... | $2.95 |

Under the head of "Building Cistern," where Mr. Bechtel expects a mason to lay 700 brick per day, he allows one laborer to two bricklayers. My experience is that it is better not to deduct openings in measuring stone or brick wall, because a mason will lay up the walls of a building, or any given part of it, in less time where there are no openings than he can where there are few or many openings. The saving in materials can easily be approximated by the builder according to

the number of openings, and he will make his price per thousand accordingly. In rough work a mason can lay 2000 brick per day, and should easily average 1500. If Mr. Bechtel has laborers in the East who can tend four masons, it seems that they had better take the advice of the late Horace Greeley and "Go West," where they can make their $5 per day instead of $2. The item above given, under the head of "Extras" for laying facework in red mortar, which reads, "To 1000 brick, 70 'loads' at 2½ cents, $1.75," is a poser to me. I don't know and can't imagine what those 70 loads consist of, and how they could be used in laying 1000 brick

In the Western country 4 inches in width is a shingle, and is the basis of measurement. The shingles employed by Mr. Bechtel must be very large ones to be worth $18 to $22 per thousand. We lay shingles from 4 to 5 inches of the shingle to the weather, instead of 7 or 8 inches, as indicated in the estimate.

*Note.*—Our correspondent calls attention above to a typographical error, which, with fair copy submitted by Mr. Bechtel, and all the vigilance of expert proof-readers, has until now escaped detection. The 70 "loads" in Mr. Bechtel's copy reads "70 lbs. red," evidently indicating the amount of coloring matter required to be used in the mortar for each thousand brick. It does not require a very great stretch of the imagination to perceive how "lbs. red," at the hands of the intelligent compositor could be made to appear "loads."

With reference to our correspondent's criticism above in the matter of measuring brickwork, it seems, if we understand him correctly, that he would not advise deducting openings, but would take the openings into account in a general way, and make the price accordingly—that is, if we follow his reasoning, a wall full of openings would be priced at a less figure per 1000 than a solid wall. The difficulty that our correspondent seems to experience is this—that while there is an actual saving in material, there is no practical saving in labor. Admitting this, it seems to us that he has not devised the best means of adjusting his prices to suit circumstances. It would be better, we think, to pursue a plan like the following: Measure the wall solid, so far as determining the labor, and measure the wall with openings out for the purpose of determining the material. We think it a bad practice—that of allowing one thing to offset another—and would advise all who make estimates to let each individual item stand upon its own bottom. Labor should never be allowed to offset materials, nor *vice versa*. Each item should be figured as it actually is, and the result looked squarely in the face, in determining the price at which the job is to be offered.

### Ventilating Flues.

*From* L. P., *St. Paul, Minn.*—I desire to ask a question about ventilating flues, in answer to which I hope to obtain information that will be of value to me, and perhaps also of interest to other readers. What kind of a chimney is best for purposes of ventilation—one with an iron smoke-stack in the center of the chimney and the ventilating space around the iron pipe, or one built entirely of brick, the smoke flue on one side and the ventilating flue on the other of a division wall?

*Answer.*—Replying to our correspondent's question in the most general terms, and without knowing just how he proposes to use the ventilating flue, we give preference to the one having the iron pipe running through the center. The essential requirement in any scheme of ventilation is to obtain an ascending column of air, and this is better accomplished by means of heat imparted to the air than by any other method. In the case of a flue having an iron pipe in the center a connection is made with the latter which imparts heat to the same. Thus, in the winter time a furnace or stove may be connected with the iron pipe, and in the summer time a fire is lighted at the base of the pipe in special apparatus provided for the purpose. The objection to the second construction which he describes is the presence of brick, which is a less satisfactory conductor than iron, between the heated flue and the one which is specially set apart for the purpose of ventilation. A thin iron pipe running up through the large flue is certainly better adapted for the special purpose in view than a heated flue separated from the ventilating flue by a partition wall, which would be not less than 2 or 4 inches in thickness.

### Cold-Air Supply for Furnaces.

*From* H. & S., *Cumberland, Md.*—Is it desirable or advantageous to supply a hot-air furnace with cold air from the room above the furnace, or, in other words, to have the cold-air supply and the hot-air register on the same floor side by side? We wish you would refer this to your readers for the benefit of the trade, as it is an important question.

*Answer.*—There is no need of referring such a question to our readers. As described, the plan mentioned by our correspondents is neither desirable nor advantageous. Air to be heated should be drawn from outside. If drawn from the floor of a room, it is charged with heavy organic impurities and dust, and by repeated heatings would become foul and offensive. Besides, the furnace would not work well under such conditions. As the temperature of the room was raised, the flow through the furnace would become sluggish, and finally so slow that only a small volume of air at a scorching temperature would rise from the registers. The plan has all the disadvantages which can be thought of, and if our correspondents have stated the case correctly, we fail to see how the discussion of a proposition so absurd can possibly be of interest to the trade.

### "A Study in Suburban Architecture."

*From* ANOTHER ARCHITECT, *Birmingham, Conn.*—Well, Archie, you have had your say and we have had ours. Probably the whole thing is becoming tiresome alike to Editor and readers, so just a word or two and we are done. To begin with, we admit our error in computing the hight of summer-house floor above the lawn, and ask to be forgiven. At the same time, your explanation hardly agrees with the drawings. In the February number you say the hight of curb will be about 12 inches, and in the April number 18 inches. Now you say that 18 inches will be the hight outside at the street corner. But your drawings show Thoroughfare street to be nearly or quite level, and the lawn and street walk to be upon the same level at the front entrance. As the lawn certainly will not rise as it approaches the curb on Station street side, the hight of the latter will be 18 inches inside clear around to the summer-house, making the floor only 6 inches above top of curb, and bringing it a number of inches nearer Bob's pipe than you estimated.

We are glad you have found a way for pedestrians to escape traversing "25 or 30 feet of something" without putting your house directly in the street line. In the April number you were "not exactly clear" upon this point. Regarding the window overseat, you evidently refer to the so-called "corner window," but in the April number you say it "looks down Thoroughfare street." Therefore we repeat our former statement, that it does not command a direct view of the street. The reason we supposed you intended to use other concrete than asphalt was that, in all works relating to the subject which we ever read, walks or drives of tar and sand or gravel were called "concrete," and those of asphalt simply "asphalt;" and, as we believe this nomenclature to be in general use, we supposed you would employ it.

That thrust about the "same B buzzing in their ears" is certainly "the most unkindest cut of all;" but, having been accused of throwing mud by one who is able to say, "there is too much forgiveness in our nature," we will not retaliate, feeling sure that as long as you and your companion remain so near the junction of the street and stable-yard, you will find more mud and blacker than any we have thrown. Were we in your place we should hardly feel like being able to occupy the study only by gaslight. Rather, we should expect to leave the busy office, looking, as it probably would, out upon some noisy street, early in the day, and go home to the quiet study to work out our difficult problems, unannoyed by intruders. We do not "enthuse" over balloon framing either, but we have always made it a rule to endeavor to find and retain whatever good points there may be in any method of doing a thing, however erroneous the method as a whole may be. Concerning the other points, you do not advance any arguments, but simply repeat what you have said before—that you believe your way to be correct. Remember, Archie, reiteration is not logic or sound argument. Otherwise your position, like that of the Rev. Jasper, who continually exclaims, "The Sun do Move," would be incontrovertible.

### Plowing Window Jambs.

*From* B², *St. Paul, Minn.*—In response to the correspondent from Ottawa City, who inquires about allowances for plowing window jambs, I would reply that $\frac{1}{32}$ inch is commonly allowed for plowing a window jamb for the sliding of sash.

## STRAY CHIPS.

MR. D. E. CONKLIN has commenced the erection of a 5-story warehouse on Sharp street, between Lombard and German streets, Baltimore, Md. It will be constructed of brick and iron, with stone and terra-cotta finish. The designs were prepared by Mr. Charles L. Carson, of that city. The cost of the building is estimated at $20,000.

MR. JOHN P. BRENNAN, architect, of Pittsburgh, Pa., has recently finished the plans for a new market building, 80 x 140 feet in size, to be erected on Frankstown avenue, East End, in that city.

MR. PETER A. CASSIDY is putting up, on the northeast corner of Forty-ninth street and Third avenue, New York City, a stone building, 50 x 115 feet in plan and 7 stories in hight. The structure will be of brick and cost about $80,000.

ON THE corner of State and Schiller streets, Chicago, Ill., Mr. L. K. Smith has in progress of erection a 2-story residence in stone and brick. The building has a frontage of 50 feet and a depth of 70 feet. The fronts will be of elegant and costly design, and the interior will be finished in hardwoods. The cost is estimated at $30,000.

THERE IS a demand for steady, competent carpenters in St. Louis, Mo.; also for good stair-builders. Some bosses are advertising for men and cannot get them. The winters in St. Louis being so mild, there is considerable building throughout the year, and good, reliable workmen quickly find employment and make good wages the year round.

GEO. W. MOYER, of Altamonte, Fla., has devised a very handy rig in his sawmill. He has a pony-planer and a lath mill, both of which he desires to run independent of his mill engine. He has, therefore, purchased a 6 x 6 Westinghouse engine, which he has bolted down to the floor midway between the two tools, and at such a distance from the engine that the same belt may be changed to either machine at will. As it is more convenient to have the two tools run in opposite directions, the engine is made reversing by a simple slip eccentric, so that it will run either way as started. As he wishes to run but one of the machines at a time, it is only necessary to shift the belt to whichever machine is wanted, start the engine by the wheel in the desired direction and go to work.

THE CORNERS of the new State, War and Navy Departments building in Washington, D. C., are said to be settling into the clay beneath, which has caused some of the long pieces of granite in the corners to crack. Some of the fissures have been filled with mortar, while in other cases the granite will have to be replaced The officers of the corps of engineers in charge of the building say that the work involved in the repair of the corners will be slight, and that no permanent injury has been done to the building.

A LARGE STORE and office building has lately been commenced on the site of the Potter building, bounded by Park Row, Beekman and Nassau streets, New York, that was destroyed by fire on January 3, of last year. The structure will be 96 feet 9 inches by 144 feet 9 inches in dimensions and 11 stories in hight. The materials used in the construction of the walls and front will be the best bricks, pressed bricks, terra-cotta and iron. The roof will be flat, with a good pitch, and will be tiled and tinned. The walls will be 40 inches thick at the first story, 36 inches at the second, 32 inches at the third and then gradually diminishing until they reach the roof, where they will be 20 inches. The roof and floor beams will be of rolled iron, and all floors, except the basement, will be laid on iron girders. The edifice will be put up by Mr. Orlando B. Potter, at a cost of about $700,000. Mr. N. G. Starkweather was the architect who furnished the plans.

THE CHICAGO, BURLINGTON AND QUINCY RAILROAD CO. have just commenced, at Creston, Iowa, the erection of a library building 50 x 70 feet in plan for the use of their employees. The structure will be of pressed brick and red tiles, 2 stories in hight. It will be very elegantly finished in hardwood. The same company are also putting up at Des Moines, Iowa, a depot 50 x 150 feet in dimensions, 1½ and 2 stories in hight. The building will be of pressed brick, with ornamental cut-stone trimmings.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=OCTOBER, 1883. NUMBER 10

## The Adze.

BY CALL SMITH.

Concerning the origin of the adze little is known. It is perhaps one of the earliest tools invented, and has been in existence so long that the memory of man "runneth not to the contrary." It is of frequent occurrence in Egyptian sculpture and painting, and was undoubtedly the principal tool for wood-working used by that people, and, in all probability, by contemporary and earlier races. These adzes were generally of bronze, bound by sinews or cords to handles of tamarisk. They were of various forms, according to accident or the caprice of the maker, and of different weights, but commonly possessed a straight blade having either a straight or curved edge. As a rule, they were smaller than the modern adze, with shorter handles, and intended for use with one hand, after the manner of the hatchet. Much more primitive adzes of stone or shell are found in more modern times among the barbarians of Europe and the New World. The West India islanders made them of shell or flint, and fastened them by a thong to a helve or sometimes to a withe. A very peculiarly shaped adze is used among the Indians living on Puget Sound. It has a pointed angular edge resembling the cutting-tooth of a reaping-machine sickle, and a very thick, short handle, in grasping which both hands are necessary. While among the Tahitians, Captain Cook found them using stone adzes similar to those of the South Pacific islanders. Some of these, for felling trees, weighed from 6 to 11 pounds, while others for carving, &c., weighed a few ounces. These needed continual sharpening, and a stone was kept in readiness for that purpose. Among all Indians and barbarous peoples the adze was the especial tool for hollowing out canoes.

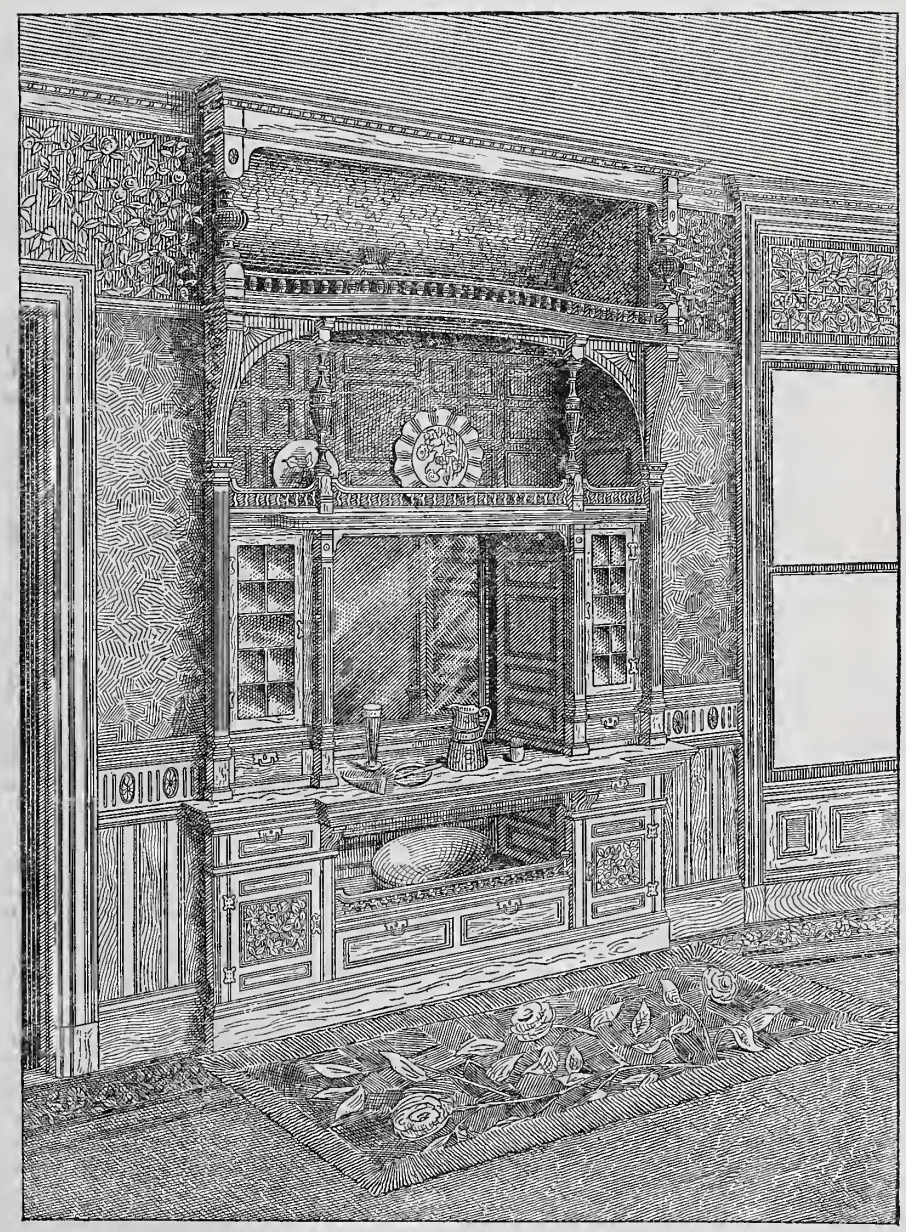
The blade of the adze is usually slightly curved, and swings, with the helve and arm as a radius, in or near the arc of that curve. In India, however, the blade is straight, and at an angle of about 60° to the handle. The edge is either straight or curved, and an adze for notching is made with a straight blade having a straight edge. The best modern adzes weigh from 2 to 4 pounds, and are fitted with handles from 2 to 2½ feet in length, according to the taste of the artisan or the purposes for which they are intended. As a guard against accident in using them, the mechanic causes his arm to strike against his thigh at every blow, thus creating a stop. In rough work he directs the adze through the space between his feet, and works with surprising rapidity. There is nothing new in the principles of this tool. Modern skill and science have produced cheaper means of making it, and have given to it a finish and a lightness superior to that of olden times, but in design it is the same adze that wrought the galleys of the Nile, that carved the triremes of warlike Greece and "ground the arches of Christian Rome."

## A Study in Suburban Architectur..*

BY AN ARCHITECT.

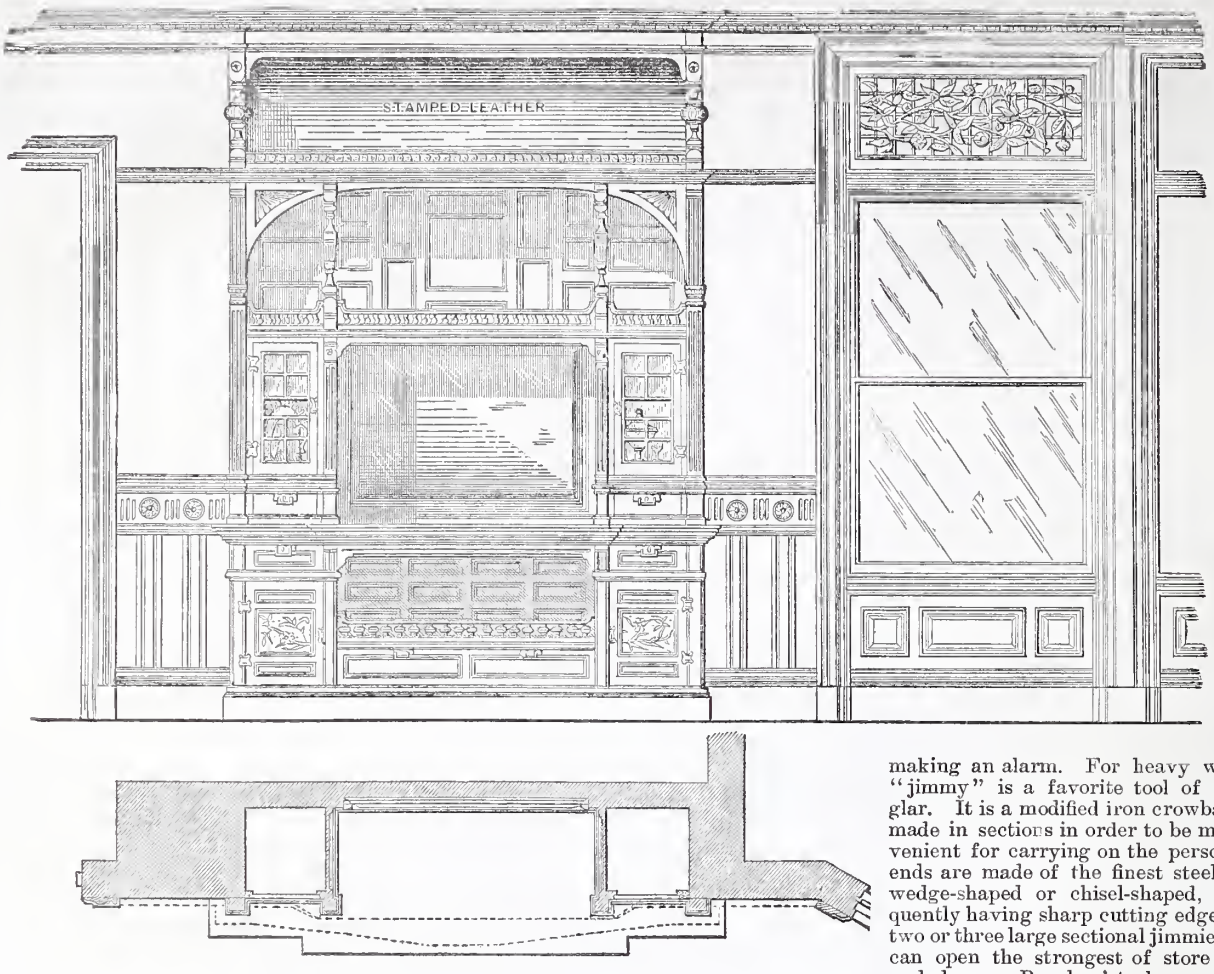
### The Dining-Room.

Especial care should be taken, in planning houses in the country, that the dining-room be given a good situation among the several rooms. The eastern and western light is always desirable, but here the rays are caught from half the circle. Plenty of light is always desirable in the dining-room, not only that we may see to eat, but that we may employ such dark, rich and restful colors in the decorations as will give the room a calm and quiet dignity. The woodwork of our room will be of fine quartered oak, stained but slightly darker than its original color, and finished with a dead surface. The floor will be of narrow oak, with a simple border. The sideboard is to be of oak, stained so as to match the woodwork of the room. The panels in the lockers to be antique bronze for those below the counter, and the doors above to be fitted with beveled plate-glass set in lead sashes. The cove above the upper shelf is to be fitted with a greenish-blue stamped plush. The trimmings of the sideboard are to be in old brass. The room will be wainscoted with oak for the wainscot, or at least a chair-rail is always indispensable in this room. On the walls of the room will be hung a heavy, dull blue flock paper, with a stamped damask pattern. The frieze is to be Lincrusta-Walton, in conventional fruit pattern and touched with bronze. The ceiling will be decorated in a dull bluish-green, the surface first being covered with a coat of thick paint, brushed up into masses and wavy lines. The furniture in this room will be of oak, stained like the woodwork of the room, and upholstered in embossed leather. The dining-room closet will be finished in every way to correspond with the dining-room.



*Study in Suburban Architecture.—Perspective View in Dining-Room, Showing Sideboard in Recess.*

* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.

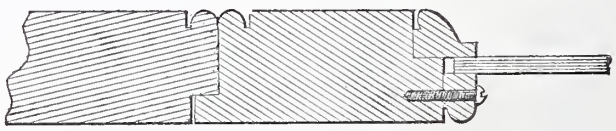



*Study in Suburban Architecture.—Elevation of Side of Dining-Room, with Plan of Sideboard.—Scale, ⅜ Inch to the Foot.*

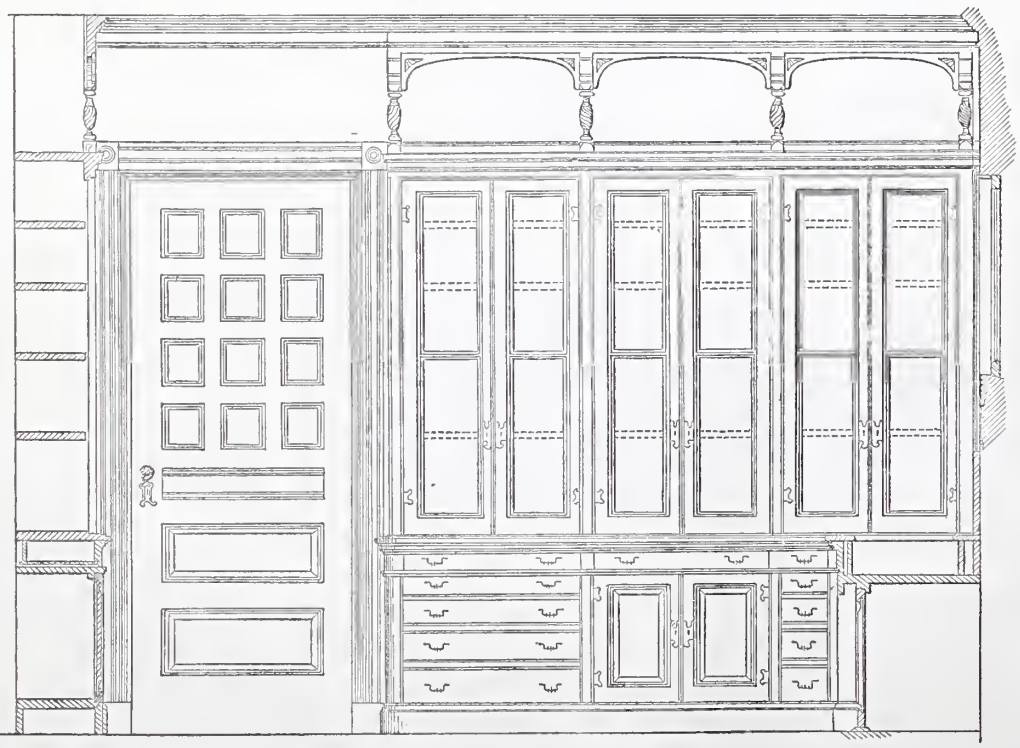
The doors above the counter shelf will be glazed with crystal plate-glass, and the trimmings to be of old brass. The fixtures are designed in three stages. In the upper stage a space is had for pottery and ornamental plates.

## Burglars' Hardware.

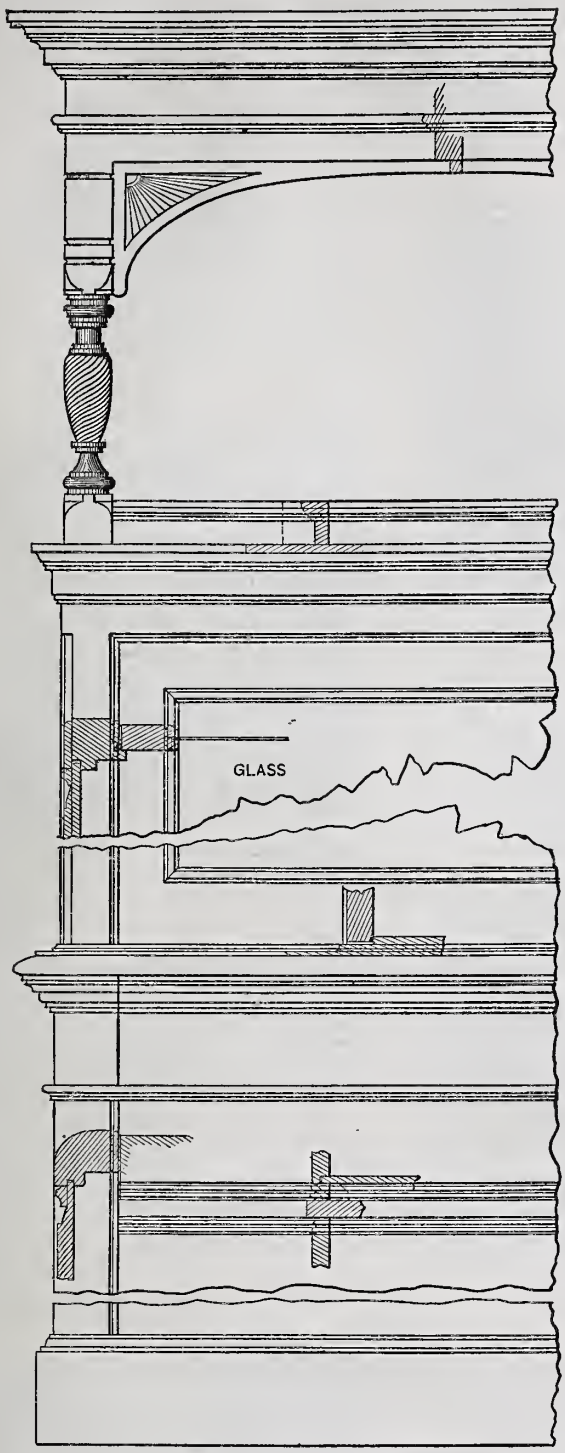
In two large glass cases at Police Headquarters in this city are displayed hundreds of implements which have been used by burglars in making their way into dwelling-houses and stores. There are implements with which robbers exert great force in breaking open heavy doors and shutters and in wrenching off the hinges of safes. Much noise is necessarily caused in their use. There are others which are used so silently that with their aid a burglar can enter a room where persons are sleeping without making an alarm. For heavy work the "jimmy" is a favorite tool of the burglar. It is a modified iron crowbar, often made in sections in order to be more convenient for carrying on the person. The ends are made of the finest steel, usually wedge-shaped or chisel-shaped, but frequently having sharp cutting edges. With two or three large sectional jimmies thieves can open the strongest of store shutters and doors. Burglars' tools are made of the best materials, and the mechanical workmanship displayed in them is of the best. Most of them can be used readily as deadly weapons of offense and defense. Several of the best jimmies at Police Headquarters were made by Adams, alias Moore, the bank burglar, now in prison. Other implements made by him are fine diamond-pointed drills, bits and braces. Persons who rely on iron bars, set across the basement windows of their houses to keep out thieves would be astonished by the working of "dividers"—long screw bolts on which are nuts attached to hooks. A few turns of the bolts, by means of a lever, will spread bars far enough apart to permit a man to enter. When robbers wish to open doors without breaking them, they often use pick-locks or skeleton keys, of which there are many specimens at Police Headquarters. Keys left in locked doors are turned from the outside easily with a pair of slender pincers called "nippers." Occupants of houses should protect themselves against the use of such implements, however, by a simple device recommended by the detectives. A piece of strong wire, about a foot long, bent over the handle of a door and passed through the ring of the key, will make it impossible to unlock the door from the outside.



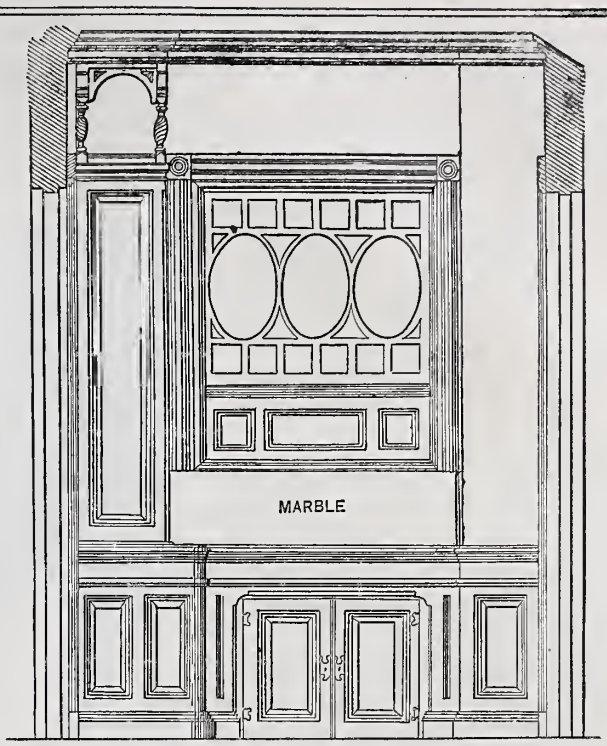
*Section Through Meeting Joint.—Half-Full Size.*



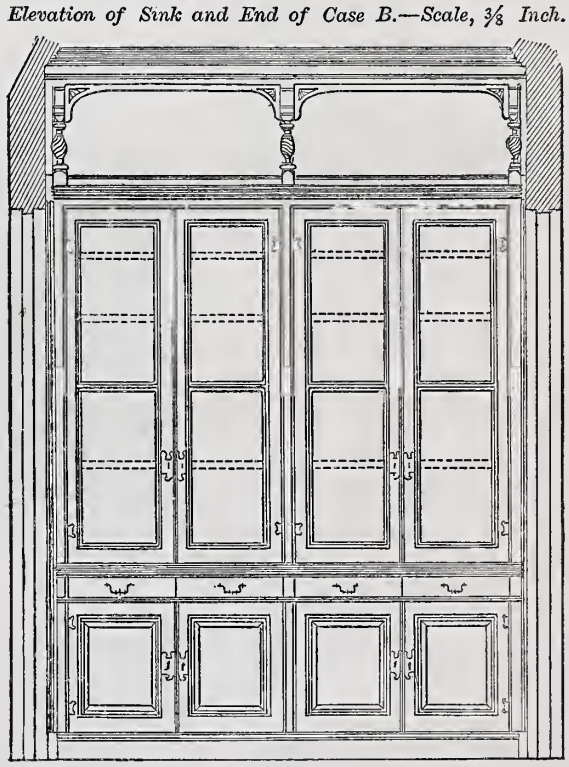
*Elevation of Case B, as Shown in Plan on Opposite Page, with Sections Through Case A and Sink.—Scale, ⅜ Inch to the Foot.*



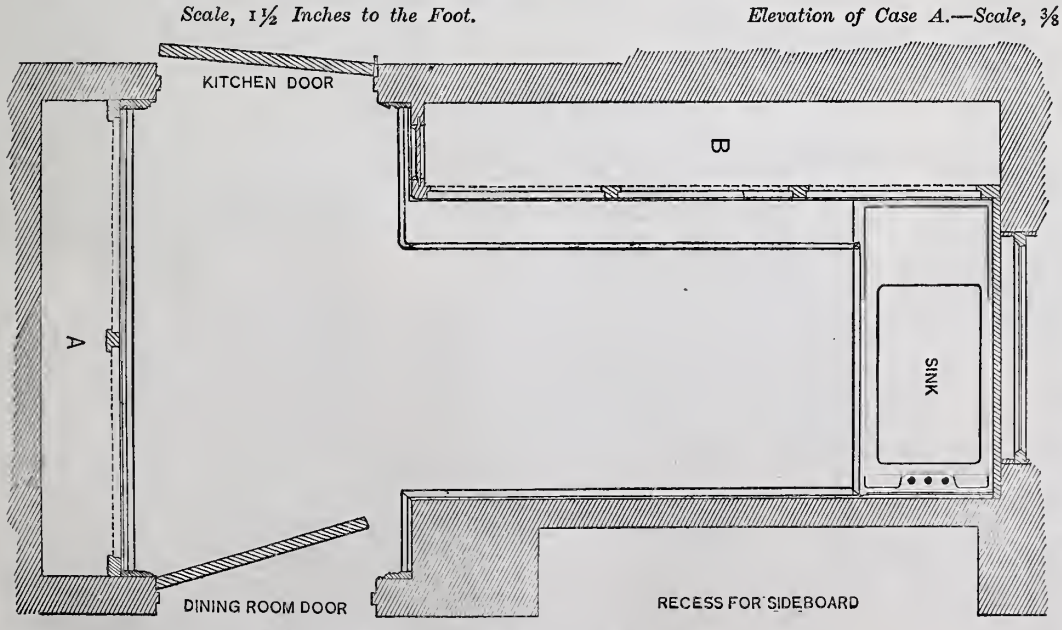

*Study in Suburban Architecture.—Detail of Sideboard.—Scale, 1½ Inches to the Foot.*




*Elevation of Sink and End of Case B.—Scale, ⅜ Inch.*



*Elevation of Case A.—Scale, ⅜ Inch to the Foot.*



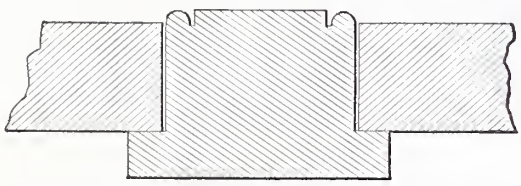

*Plan of Dining-Room Closet.—Scale, ⅜ Inch to the Foot.*

Burglars laugh at the fastenings of windows which are not guarded by strong shutters. On windy nights they quickly cut out pieces of glass near the fastenings, using a piece of putty to deaden the sound and to keep the glass from falling inside the window. The noise made in the operation will not waken a light sleeper. Large pieces of wooden shutters are removed by the use of fine augers and greased saws. When proper openings are made the thieves can remove ordinary window fastenings, and even heavy cross-bars, without arousing the inmates of a house. Among the articles used by thieves are dark lanterns, face masks, pistols, knives, leaden mallets, rope ladders, bits, braces, and many tools used by carpenters and machinists.

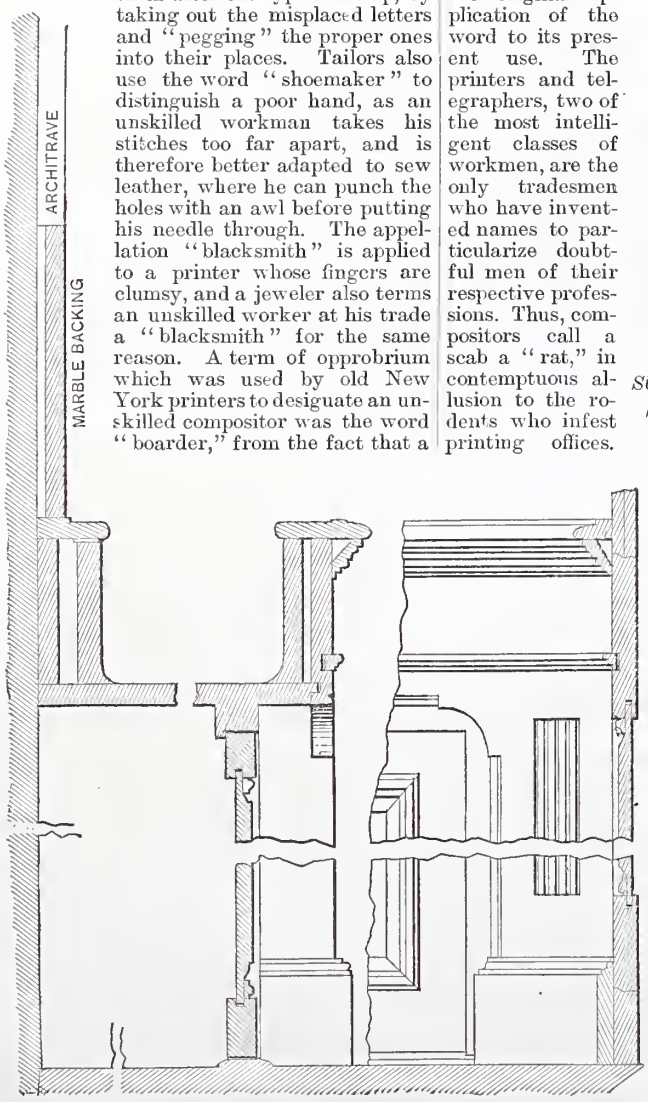
## Skilled and Inferior Workmen.

Strikes bring out the technical slang of the trades, and particularly the opprobious epithets with which the different classes of workmen distinguish the unskilled operatives who labor at the same trades. In most cases it will be found that these slang terms originate in some technicality of the trade. Thus, the telegraphers call a poor operator a "plug," after the little metal implement which divides the switches on the key-board, inasmuch as the plug, or "key," is a comparatively unimportant part of the machinery. Printers designate an unskilled type-setter a "shoemaker" or a "blacksmith." The derivation of the former appellation is from the fact that a compositor who makes errors is obliged to correct them after the type is set up, by taking out the misplaced letters and "pegging" the proper ones into their places. Tailors also use the word "shoemaker" to distinguish a poor hand, as an unskilled workman takes his stitches too far apart, and is therefore better adapted to sew leather, where he can punch the holes with an awl before putting his needle through. The appellation "blacksmith" is applied to a printer whose fingers are clumsy, and a jeweler also terms an unskilled worker at his trade a "blacksmith" for the same reason. A term of opprobrium which was used by old New York printers to desiguate an unskilled compositor was the word "boarder," from the fact that a poor hand was usually a drinking man, aud spent his time loafing or "boarding" in liquor saloons. All striking trades-workers in common use the generic word "scab" to distinguish the workmen who take the places of strikers. The derivation is plainly from tho fact that the scab is but a morbid growth, and lives only at the expense of the well-being of the rest of the body. Shakspeare uses the word scab as a term of opprobrium, and Webster defines a scab thus: "a mean, dirty, paltry fellow," which may have suggested the original application of the word to its present use. The printers and telegraphers, two of the most intelligent classes of workmen, are the only tradesmen who have invented names to particularize doubtful men of their respective professions. Thus, compositors call a scab a "rat," in contemptuous allusion to the rodents who infest printing offices.

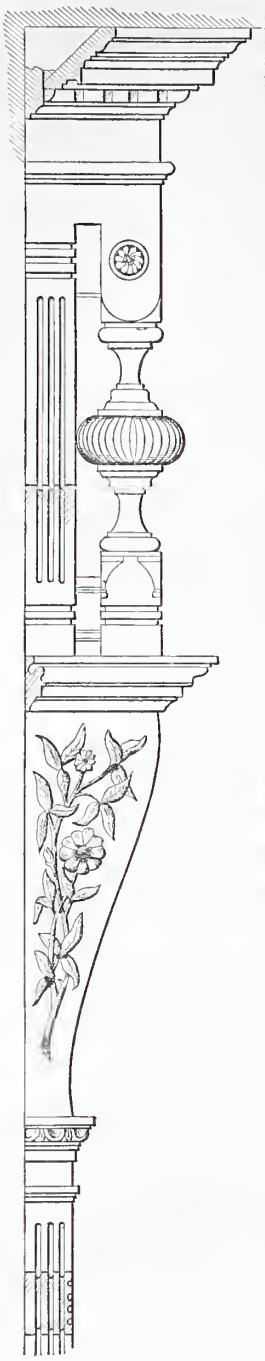
*Study in Suburban Architecture.—Edge of Molding of Marble Bracketing and Section Through all Shelves.—Half-Full Size.*



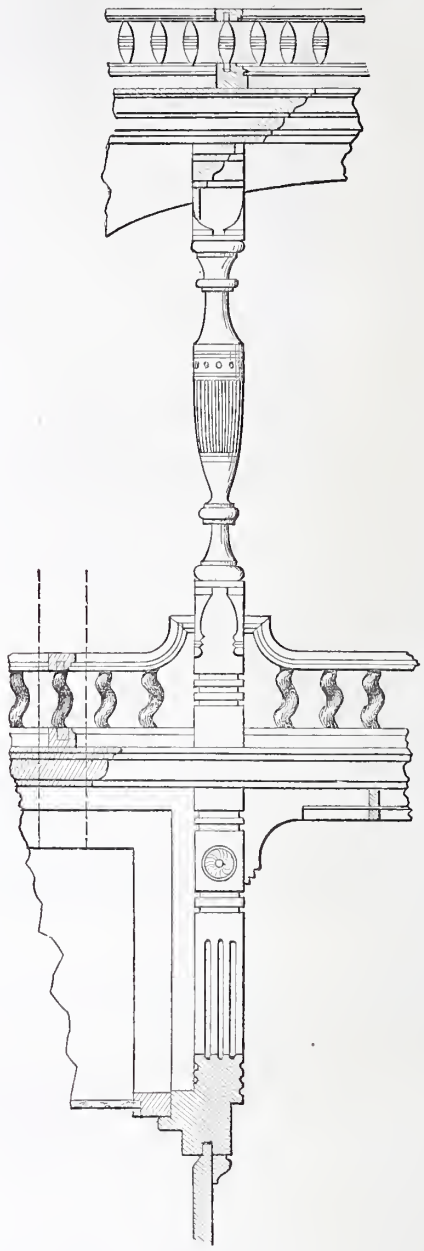
*Section Through Standards in Closet Work.—Half-Full Size.*




*Detail and Section at Sink, as Shown in Plan.—Scale, 1½ Inches to the Foot.*



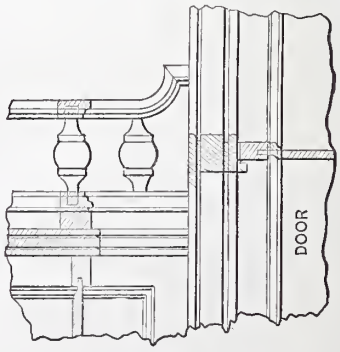
*Side Elevation of Finish Above Sideboard.–Scale, 1½ Inches to the Foot.*



*Details of Railing and Posts Above Sideboard.—Scale, 1½ Inches to the Foot.*

The telegraphers have only recently invented a term for scab operators. They call them "contumists," though the application is not of technical derivation, but is probably an attempt to manufacture a word from the Latin *contumae*, the root of contumacious, to describe a stubborn aud obstinate person.

The various names actors give to the unskilled members of their profession are familiar to most of the reading world. A poor actor is termed variously a "stick," "fakir," "statue," or "dummy. A "stick" or "statue" is, naturally enough, an actor who is awkward and stiff on the stage. The term "dummy" is derived from the fact that when a traveling company has not enough members in the troupe to fill up a large stage, men and women are employed to staud in the back with choruses or supernumeraries, and take no other part. They are called "dummies." "Fakir" is a generic term, and comprises those actors who lack talent and depend upon other resources. For instance, a comedian who makes faces is called a "mugger," and a tragedian who bellows is a "ranter," and both are "fakirs."



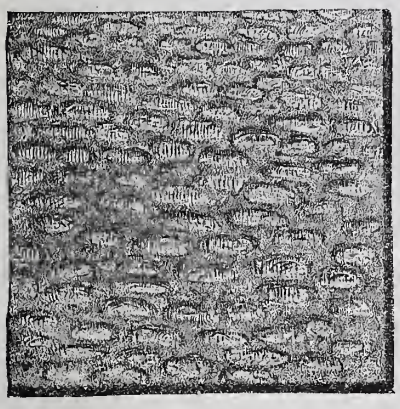

*Detail of Railing to Shelf Below Sideboard.—Scale, 1½ Inches to the Foot.*

The professors of the manly art are also apt in this style of nomenclature. They call a cowardly fighter a "duffer," and a weak or uuskilled boxer a "sand-bag," or a "stuff," the latter terms beirg derived from the contrivance upon which the pugilist does his practice.

## Practical Stone-Cutting.

(Concluded.)

In continuing Professor Trowbridge's paper, a considerable portion of which we presented in our last issue, we next give attention to a description of surfaces of freestone. Figs. 9 to 20, inclusive, show the surfaces of some freestone from the Bay of Fundy quarries, Nova Scotia, dressed, to illustrate the methods of cutting that material, and were engraved from models now in the museum of the Columbia School of Mines. The tools used in dressing this stone were described in our last number, and consist of mallet-head points made out of ¾-inch bar steel, ¾-inch drafting chisels, tooth chisels and droves 2½ inches wide, and mallets of 4 and 6 pounds



*Practical Stone-Cutting.—Fig. 9.—Sparrow-Picked Freestone.*

weight. Fig. 9 represents what is called sparrow-picked. This is picked out with a very small point and a mallet of about 2 pounds weight. Fig. 10 represents rubbed work. This is done by a laboring man taking a piece of the same stone, or else a piece of Connecticut brownstone, and rubbing the face with sand and water until the marks of the driving chisel have disappeared; then he gives a few rubs with Ohio sandstone, or with a little white sand, in order to make it look a little finer, and to take out any scratches that may have been left after the first rubbing. Fig. 11 represents tooled work. The dent or impression is made by the chisel in one continuous stripe. The chisel is 2 inches wide.

Fig. 12 represents tooth-chiseled, which is made with any chisel not less than 1 inch

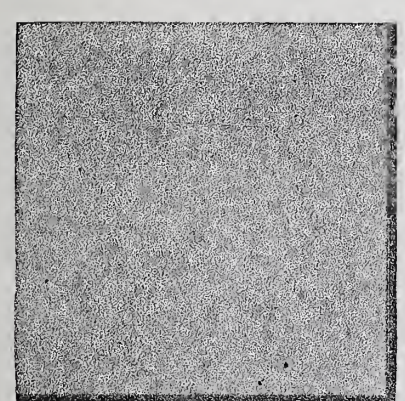


*Fig. 10.—Rubbed Freestone.*

wide. Fig. 13 represents superfine bush-hammered, which is very fine work, and speaks for itself. Fig. 14 represents very fine droving. Droving on soft stone is, in comparison to fine axing on granite, very difficult; therefore the soft-stone cutter is entitled to great credit for this style of work. His left hand holds the tool and guides it, while the right lifts the mallet and descends with a crushing blow upon the tool, and leaves a square dent or impression after it perpendicular to the bottom. He must have a steady hand to control the chisel. Now, the granite stonecutter has all this art boxed up in a steel case, with many blades bolted together, and a long wooden handle attached to it. He takes hold of the patent ax with his two hands and begins pounding away on the face of a piece of granite, and leaves the dent or impression. Any person of ordinary skill can pick up this part of the craft; so much for the patent ax. This is the reason that the brownstone cutter gets $4.50 per day for eight hours' work, while

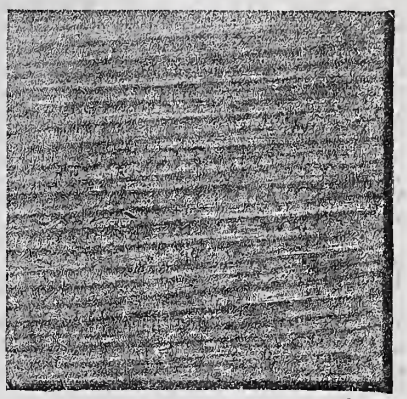


*Fig. 11.—Tooled Freestone.*

the granite stonecutter only gets $3.50 per day and works 10 hours. There is more science displayed in one day in a soft-stone yard than can be seen in a month's work in a granite establishment.

In Fig. 15 we have an example of fret-work. This is made with straight grooves of many turnings, but in all cases at right angles to each other, and with width of groove equal

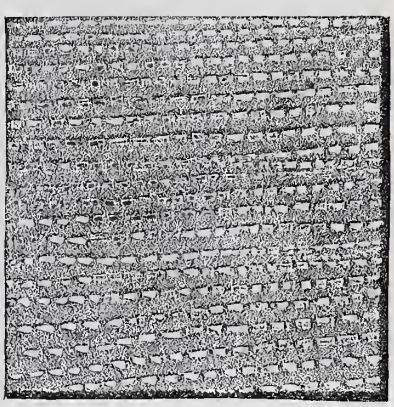


*Fig. 12.—Tooth-Chiseled Freestone.*

to width of spaces. This work is accomplished with a carving splitter $\frac{3}{16}$ inch wide. In Fig. 16 is shown a specimen of Grecian Doric fluting. The tools used are tooth chisels and plain chisels ¼ and ½ inch wide. In Fig. 17 we have Corinthian and Ionic fluting, with beads worked in. The tools used are tooth chisels and plain chisels ¼ and ½ inch wide. Fig. 18 shows what is called

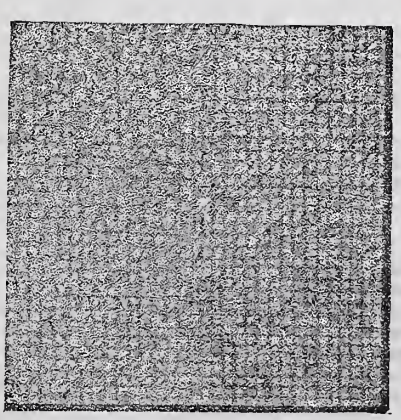


*Fig. 13.—Superfine Bush-Hammered Freestone.*

frosted work with random penciling. The holes are sunk with a carving splitter ¼ inch wide. The ridges are rounded off by a tooth chisel ⅜ inch wide.

Fig. 19 is a sample of what is called bush-hammered work. Fig. 20, random pointed ashlar. In Fig. 22 a specimen section of a return molding is given, very careful directions for producing which are contained in Professor Trowbridge's paper. This molding was cut out of Potsdam sandstone. It is worked by the stonecutter on the same principles and system as in cutting granite. This stone, although it is a little softer than granite, will dull tools more than granite. The first work to be accomplished in work of this kind is to cut the top bed by chiseling four drafts out of winding; then point off the waste or *débris* down to the level of drafts; then use the pane ax on any lumps left by the hammer point. The tools used on this bed are a ⅞-inch chisel and a ⅞-inch hammer point. Next, turn up the intended face or front edge, and run an arris-draft, making it wide enough to cover the top surface of the nose. Then square the ends or meeting joints with right angles to the top bed and nose-draft. When this is

*Fig. 14.—Very Fine Droving in Freestone*

done, apply the section pattern to the ends by keeping a straight-edge in one hand, say, the right, and with your left hand pressing the pattern against the stone. Place the straight-edge on the nose-draft and keep the pattern up to it; then apply the straight-edge on the top bed in two or three places, and bring the patterns flush to it; then scribe the whole outline of the pattern with a cast-steel pointed scribe or a piece of iron ore. When this is done on both ends of the stone, turn up the setting-bed, and cut it to the given lines of the pattern. The top bed being cut out of winding, and the joints being cut at right angles to said bed, the same pattern being applied to both ends will give the setting-bed truly out of winding.

The next step is to draw such a chamfer line on the ends of the stone as is tangent to

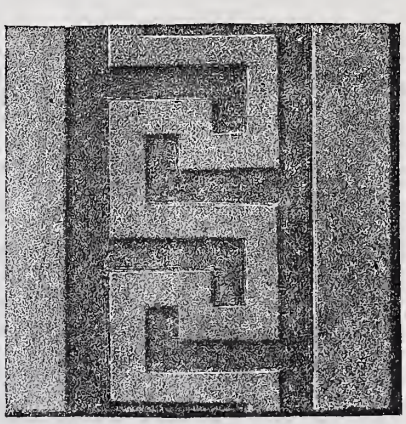
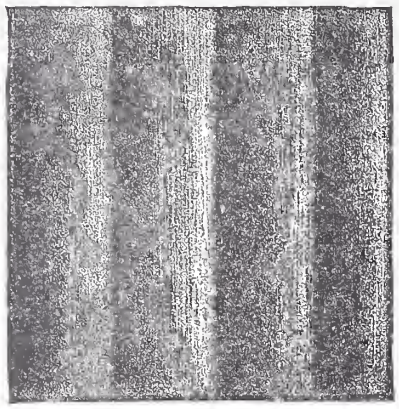


*Fig. 15.—Example of Fret-Work in Freestone.*

the greatest number of members; then cut to the lines, which will give a chamfer, or inclined plane. Then the stonecutter commences molding. Working from right to left of the stone, he completes all of this edge except the cove or scotia. He cannot cut this trough until the returned head is precisely as far advanced, because it is less than a right angle from the face of the stone. His next work is to turn up the quoin end

or returned head, chisel the nose-draft, square the adjoining end, and apply the pattern as usual. Then he has to find a miter line of the intersecting line of all the members. To do this he turns up the setting-bed



*Practical Stone-Cutting.—Fig.* 16.—*Grecian Doric Fluting in Freestone.*

and draws two lines parallel to and equally distant from the two faces. A line drawn from the intersection of these lines to the intersection of the nose-draft at arris will make an angle of 45° and be the true miter line of the stone. Then he has to mold the edge from the given miter line along the quoin. When this is done he turns up the setting-bed and cuts the scotia on the two edges. After being molded with the chisels the patent ax is applied, and the molding is done. This stone is molded with ¾-inch and ½-inch hammer-head chisels and ¾-inch and ½-inch points of bar steel. Two and one-half feet length of this molding is a good day's work for a stonecutter.

In Fig. 21 a label molding is shown cut out of sandstone, from the Bellaire quarries of Ohio. The first work on this stone is to take the front face out of winding by cutting four chisel-drafts on the margin of the stone, the width of chisel being ¾ inch. Then point off the waste down to ¼ inch of the draft level with a mallet-head point made out of ¾-inch bar steel. Then take a large-sized tooth-chisel and chisel the whole surface. The stonecutter then takes a large-sized drove and droves it over perfectly straight and smooth, to suit a good straight-edge. This face is then finished. The tooth-chisel is 2½ inches wide, and the drove 2½ inches wide; the pointing-mallet 4 pounds weight, and the droving-mallet 6 pounds weight. The stonecutter now takes the face pattern cut out of zinc, applies it to the chiseled face, and scribes the outline with a lead pencil; he takes a drove and pitches

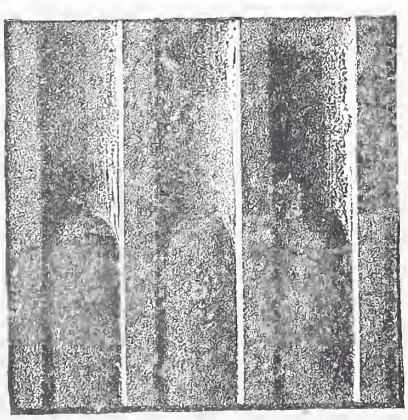


*Fig.* 17.—*Corinthian and Ionic Fluting in Freestone.*

off all waste outside of the lines; he turns up the convex side of the stone, which is supposed to be the top bed, and runs an arris-draft, keeping as close as possible to the pitched line. When this arris-draft is complete it must fit the concave templet. His next work is to run a draft on the bed at each end of the stone, at right angles to the face; then he points off the waste to the eye; he puts on his concave templet and tooth-chisels the bed with drafts until it fits the templet; he then takes his drove and droves it back from the face, say, 4 inches, to the projection line; past the wall line it does not need droving, for the rest of the bed is buried in mortar. This is a rule in all stone-cutting—no stone needs droving that is embodded in the wall. If lumps are left it is "nobled"—that is, struck in a few places where the eye judges there are lumps.

The next work is to square the meeting joints. This is done by cutting the face arris-draft, then squaring down the depth of the joint with two chisel-drafts at right angles from the face, pointing off the waste of the intermediate, and then tooth-chiseling and droving it over. This is done for both joints. Then the stonecutter takes his section pattern in his left hand and applies it to the end of the stone. Keeping his fingers pressed tight against it (he must not let it slip), he calls on his nearest fellow-workman to help him by holding a straight-edge on the face projecting over the end of the stone. He takes hold of the concave templet with his right hand and presses it on the top bed of the stone. He keeps the edges of the pattern pressing against the straight-edge and the concave templet; this will adjust the pattern. Then he scribes all of the outlines; he turns up the concave or setting bed, runs a draft at each outline on this bed, the line being given by the section pattern. When these two drafts are complete he takes his No. 1 concave templet and applies it to the stone, cuts to suit the templet, and this bed is done. His next work is to draw chamfer lines on the ends of the stone tangent to the

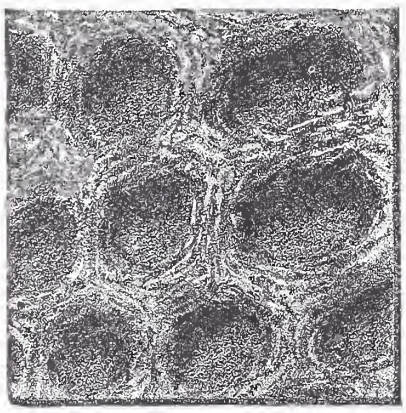


*Fig.* 18.—*Frosted Work with Random Penciling in Freestone.*

greatest number of members; then he cuts the chamfer or inclined plane. The chamfer is the most important of all the moldings in in stone-cutting; it shows every man in the business his way out; we cannot cut a common molded step without chamfering. Very often stonecutters commence racing on their work to show their strength and ability. It is then they will try to avoid cutting the chamfer and take a short cut. They who do this have not got a straight member, and their work looks ridiculous—not fit to go into a building. But he who cuts the chamfer, his face will not blush in the race, for the longest way round is the shortest way home. He will not be ashamed of his work when finished, even admitting that he is a little way behind. The architect is blinded very often in this work; the stonecutter is in a hurry to beat his antagonist, and will not adhere to the outlines given by the architect; probably when a scotia should have been sunk ¾ inch in the middle of a stone 5 feet long, the stonecutter might not have sunk to a depth of ½ inch, but he is sure to have it right at the ends. On the stone are shown the chamfer and the cutting lines of the solid of each member; also a portion of the mold finished, ready for rubbing. There is a templet to correspond with each cutting line on the face of the stone. When the stone is placed in working position, with its face uppermost, the templet is laid on the chamfer. The tools used in molding this stone are ½-inch and ¼-inch chisels, points made out of ⅜-inch bar steel, and a molding mallet of four pounds weight. Four feet in length is a good day's work of this sort.

Fig. 25 shows a carved boss, cut out of sandstone also from the Bellaire quarries. This block was cut into a solid cube, previous to being rounded off, to receive free-hand penciling. The operator bankers up the front face, takes it out of winding by four chisel drafts—¾-inch chisel used—and then points off the waste to within ¼ inch of draft level. He then takes the largest

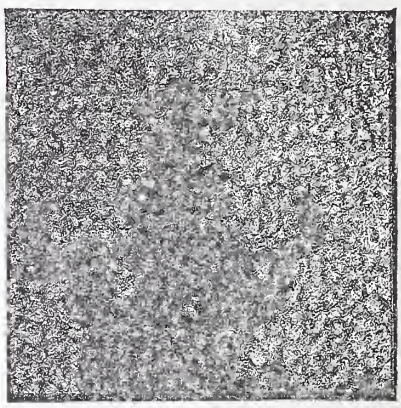


*Fig.* 19.—*Bush-Hammered Freestone Work.*

size tooth chisel and a six-pound mallet made out of hickory wood, and chisels the face to a surface level with the drafts. He then takes the largest size drove and with the same mallet droves the tooth-chiseled surface over. Then, having finished the first work, he lays out the full size of his stone, by drawing four lines to represent a square; from this plane he cuts the four sides, at right angles to it; the sixth side is left rough, being in the wall. The tools he uses on the squaring up of the blocks are points of ¾-inch steel bar, ¾-inch drafting chisels, droves and tooth chisels 2½ inches wide, and a pointing or drafting mallot of four pounds weight. His next work is to turn up the top bed. This block is of strata formation, and therefore it is most essential to have the bed of stone adopted by the stonecutter the same as the natural bed. That side of the stone is always called by stonecutters the "free-way." So he will turn up the free-way for his top bed; the opposite is the setting-bed, which is the free-way also. He applies the label section pattern to the bed. This pattern projects, say, 4 inches from the face of the wall; he projects the boss surface 1 inch outside

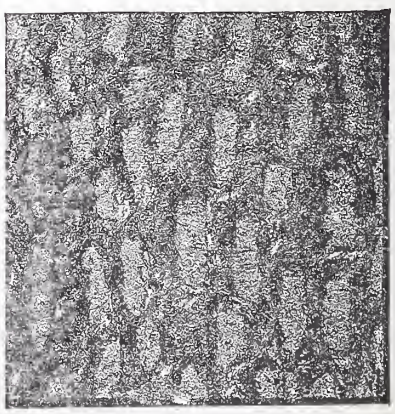
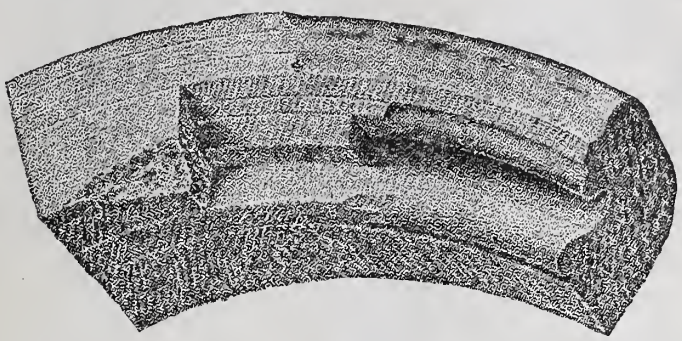


*Fig.* 20—*Random Pointed Ashlar.*

of this, which leaves it 5 inches outside of the wall line. He draws a center line on the bed at right angles to the face and finds a point 4 inches in from face on this line, and with a radius of 4 inches he describes a semicircle. This is a cutting line to bring the projecting part of the stone into a semi-cylindrical shape. Then he bisects this cylinder with a pencil line parallel with the horizon, and the lower portion he rounds off to a spherical shape, with a concave quadrant templet taken from a circle 4 inches in diameter. When this is done the stone is ready for free-hand penciling, and when penciled, he cuts the outlines of the

leaves and gets them into shape; then he takes a splitter and relieves the stems, sinks the eye, splits open the spaces, and then he rolls the face of the leaves, and so on, till he suits the eye. The tools generally used in carving are the splitters, ⅛, ¼, ½ and ¾ inch in width at the chisel end, the plain chisels of the same width, hammer-head drills and a three-pound mallet.



*Practical Stone-Cutting.—Fig. 21.—Method of Cutting a Label Molding or Drip Stone.*

## Domestic Chimneys.

The construction of the domestic fireplace and chimney, says an exchange, no doubt is one of the most important items to any householder, and yet it is strange to note the small amount of attention that is paid to their efficient construction, and the carelessness frequently shown by builders in the way in which they are built and finished. In the first place, the matter of efficient draft is an item of extreme importance to the comfort of the occupants of the room. There may

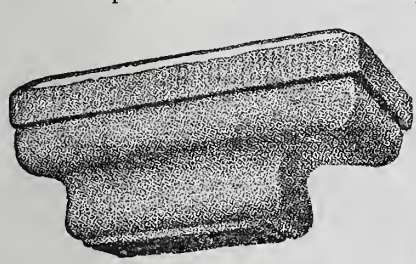


*Fig. 22.—A Return Molding.*

be three points in the construction of the fireplace and chimney, to which attention should be directed for the formation of an efficient up-draft. The first is proper proportion in the dimensions of the flue itself; second, the hight and formation of the chimney-stack, and, thirdly, the provision of a suitable supply of cold air to produce an up-draft. Taking these points in succession, we may remark that many builders nowadays adhere, without reason or without thought, to the old internal dimensions of flues, 14 inches by 9 inches, which were necessitated as a minimum when climbing boys were used, to provide a free passage for them up and down the flue. The area so provided is undoubtedly very much greater than is necessitated by the volume of hot air generated in the ordinary domestic hearth.

We had better first define the scientific conditions under which the heated column of air develops an up-draft. The draft, in other words, merely represents the velocity with which the air is traveling through the shaft of the chimney, and all arrangements should be thus made with a view to develop the formation of that upward velocity. In the column of hot air the velocity of up-draft is generated simply by the difference of specific gravity of the hot air in the chimney, as compared with an equal column of cold air in the external atmosphere. The cold column of heavier weight, by the well-known law of gaseous and fluid pressure, displaces the hot column from the inequality of pressure at the base of the chimney, endeavoring to reproduce equilibrium. As, however, every succeeding supply of cold air becomes heated in its turn as it passes through or over the fire, the constant circulation is maintained, and the result is a draft. The intensity or velocity of this draft is determined by the rise in temperature of the ascending column of air and by the smallness of the passage or shaft through which the air is traveling, so long as the passage is not too small to choke the draft. In an excessively wide shaft, then, the temperature to which the large volume of air passing through it can be raised is very much lower than would have been caused had the shaft been more restricted in area. This will serve to explain why we object technically to the construction of chimney-shafts of anything like the area of 14 by 9 inches; even the more reduced dimensions of 9 by 9 inches are considerably greater than what is necessary, since the efficiency of the flue as a draft producer is limited by the final area of the inside of the chimney-pot. This we know is usually limited to some 6 inches in diameter, more or less, and it is, therefore, the hight of absurdity and very injurious to the effective draft to have an area at any part of the shaft of greater dimensions than that of the chimney-pot. By neglecting this consideration in the design of the flues, builders seem to go out of their way to develop a smoky chimney. To produce the easiest and best draft through a flue the area should be the greatest at the exit or chimney-pot and reduced toward the fire.

We have only to look at the immense number of cowls and zinc chimney-pots that disfigure so large a number of roofs, to see that if the builder desired to maintain the architectural effect of the roof line of his building, the usual chimney-shaft supplied is far shorter than requisite to maintain the proper draft. This, no doubt, is frequently caused by the interposition of high gables, or the hight of buildings in their immediate vicinity, but we think that it behooves architects and builders to construct their chimney-shafts so as to provide for the proper draft without the necessary addition of 6 or 8 feet to the hight of the shaft in the shape of zinc chimney-top.

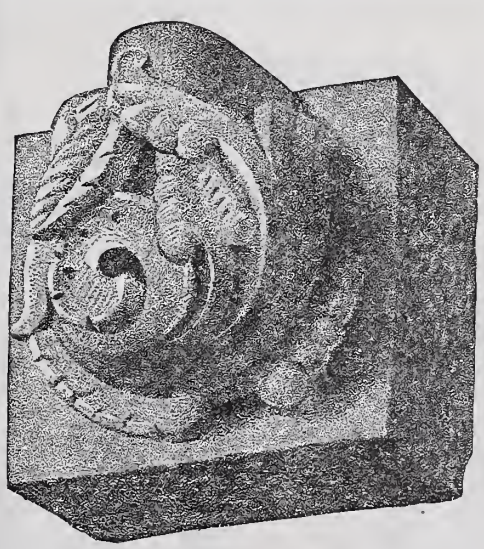


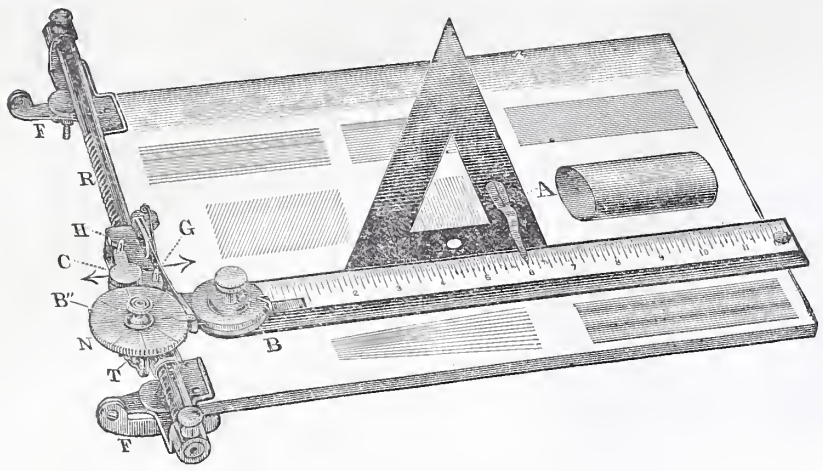
*Fig. 23.—A Carved Boss in Bellaire Sandstone.*

Having so fully dealt with the construction of the flue to determine a rapid up-draft, we have still to provide a ready access for the column of cold air, which is really the effective motive power to the hot column of air in the chimney-shaft. If the rooms to which the chimneys and hearths are fitted are themselves supplied with a suitable system of ventilation, no doubt a sufficient column of cold air will be supplied by these means. There are, however, many rooms in an ordinary domestic household which are in themselves small and stuffy, and to which no proper appliances are used for the introduction of a steady current of cold air, and it will be found frequently that it is exactly these small and stuffy rooms which are most subjected to down-drafts in the chimney. These we consider to be caused almost entirely by the absence of a sufficiently regular supply of cold air to cause a driving medium to eject the hot air from the chimney. We would suggest that if ventilation into the room is apt to produce drafts sensible to those occupying it, a smoky chimney may be often cured by the direct admission of cold air from the external wall to the hearth underneath the grate. We should in that way have direct communication between the external column of air and the hot ascending column of air in the chimney, and would undoubtedly have a rapid and effectual circulation or draft of air created up the chimney. This would by no means destroy ventilation from the body of air in the room, as such an ascending draft has a strong inductive effect.

We see also that too frequently the builders are careless with regard to the thickness of the walls forming the lining or side of the flue. It is not an unusual case to find that thickness to consist of only half a brick. This produces two very bad effects: First, it leads to a very considerable chilling or cooling of the ascending column of air, and therefore a partial destruction of the rapidity of the draft; secondly, it is a source of danger to the house itself, as very often the mortar in which the bricks are set is imperfect, and the pargeting is omitted in the interior of the flue, thus causing a very great radiation of heat from the surface of the chimney. If wood fittings, wooden beams, or the ends of joists are fitted into, or in close contact with, the chimney breasts, which is too often the case, a great danger is run of accidental ignition, and many houses that are built in an old-fashioned style for picturesque effects are sacrificed to that danger.

## Discoloration of Brick Walls.

Within late years the great popularity of brick as a building material and the great increase in the number of brick edifices which have been erected, have brought into prominence a matter which could not have escaped the notice of the most casual observer, namely, the disfigurement of brick walls from a coating of white powder resembling in appearance hoar frost or mildew. These deposits are usually formed in rainy weather, and for a long time it has been a mooted question how this substance comes to be collected, what it is, and what can be done to remove it or prevent its formation. The rains of this spring seem to have been especially favorable to the forming of these deposits, and old buildings even, which hitherto have never been defaced by this substance, have this year given up their ruddy appearance for a paler and less attractive complexion. In speaking of this subject, it has been remarked that the efflorescence is simply ordinary Epsom salts or sulphate of magnesia. The sulphurous acid which results from the burning of coal combines in the presence of moisture with the magnesia in the mortar or from the clay in the bricks. It was decided that it emanated from the former source. The sulphate of magnesia dissolves in the water, which runs over the bricks, and, evaporating, leaves the deposit. Some walls are covered with a black substance which seems at a distance to be smoke. This is a fungus, which flourishes in damp places, and is materially different from the white sulphate.




*Novelties.—Fig. 1.—The Positive T-Square and Section Liner Shown Attached to a Small Drawing Board.*

## NOVELTIES.

### Improvements in Drawing Instruments.

A correspondent inquired in our issue for August about a T-square adapted for section lining. We gave him two addresses, one referring to a tool that we had already illustrated and the other to one which we said we proposed illustrating at an early date. We take pleasure in directing attention to the latter at this time, together with other novelties made by the same firm. The instrument in question is known in the trade as the "Positive T-Square and Section Liner," and is manufactured by Messrs. W. Gardam & Son, 96 John street, New York City. In Fig. 1 we show the tool as it is ordinarily arranged for clamping on to a small drawing board. Fig. 2 shows the tool in a little different form, the clamps for fastening it to the drawing board being replaced by weights which hold it in position and adapt it for use on larger surfaces. Fig. 3 is an enlarged view of the working parts of the tool, with the operating disk, shown by B'' in Fig. 1, removed. From these several views it will be seen that the tool consists essentially of a rod on which the head of the T-square moves. Motion is transmitted and regulated by means of a rack and pinion, which permits the blade of the T-square to be passed readily over the work to see how it has progressed, and yet never fails to bring it back precisely to the line that was last drawn. The head of the disk turning the pinion, and which is

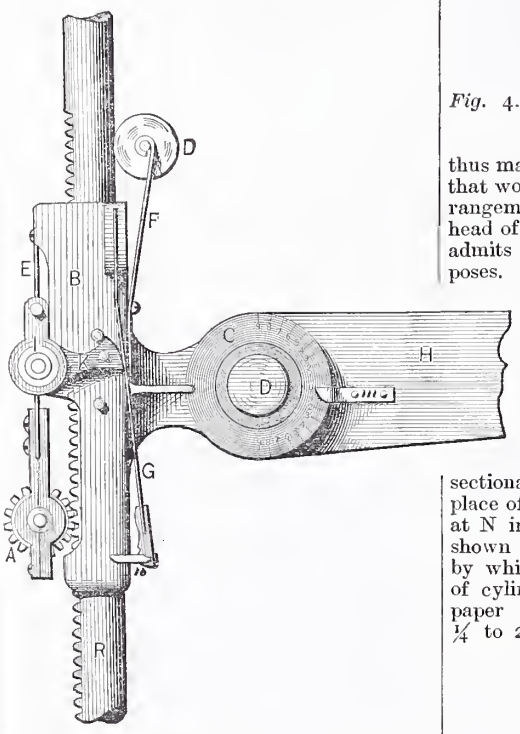



*Fig. 3.—Working Parts of the Positive T-Square and Section Liner.*

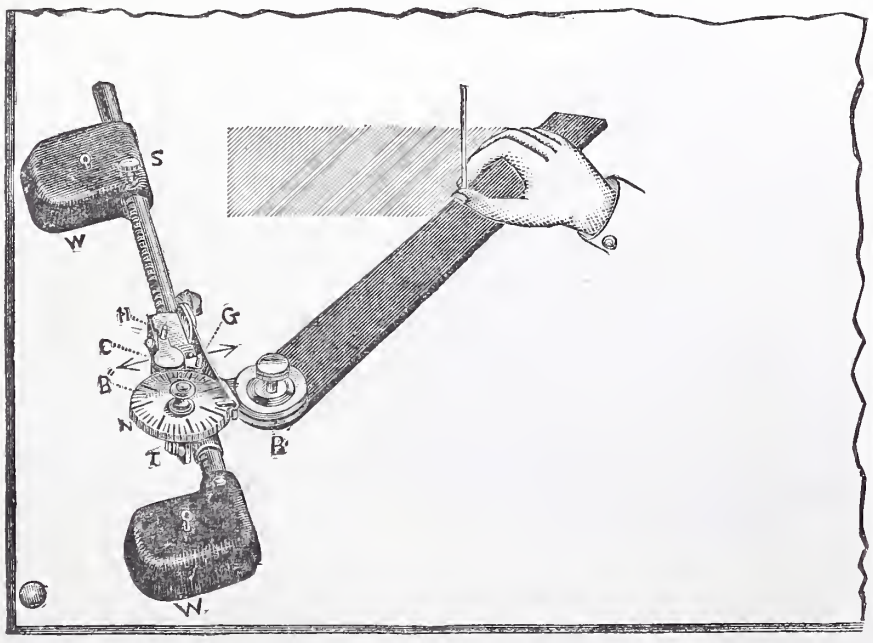



*Fig. 2.—The T-Square and Section Liner Arranged with Weights, Adapting it for Use on Large Tables.*

shown by N, in Fig. 1, and also in detail in Fig. 4, is notched or graduated in such a way that by means of the spring G, in Fig. 3, regularity of spacing is obtained. In using the T-square, it is a very simple matter to turn the milled head of the binding screw with the thumb and finger of the left hand, and thus regulate the motion at will. In order to adapt the T-square for work that is at other than right angles with the rod on which the tool moves, it is swiveled at the point B, Fig. 1. In that view the blade is shown at right angles, while in Fig. 2 it is shown thrown up at about an angle of 45°. Fig. 3 shows how the parts in connection with the head of the blade are graduated so that it may be swung at any required angle. An improved form of swivel, and which is incorporated in some of the sizes of this tool, is shown in Fig. 6. The principle in this case is the same as we have already explained, save that the edge of the blade along which the line would be drawn always radiates from the center about which it turns,

*Fig. 4.—Graduation of Disk N, Figs. 1 and 2.*

thus making it possible to do work of a kind that would be out of the question in the arrangement shown in Fig. 3. An arc in the head of the blade is graduated to 45°, which admits of adjustment for all ordinary purposes. Extreme accuracy is insured by means of the vernier shown at the right. After the blade has been adjusted as accurately as possible by the thumb-screw F, the vernier is employed for bringing it still closer to position, where it is clamped by the thumb-screw H. Various details of construction by which this is accomplished are shown in the sectional views presented in Fig. 6. In place of the regularly graduated disk shown at N in Fig. 1, a paper scale of the kind shown in Fig. 5 is sometimes employed, by which a regular guide to the shading of cylinders is obtained. Twelve of these paper disks, for diameters ranging from ¼ to 2 inches, are furnished by the manu-

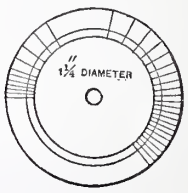
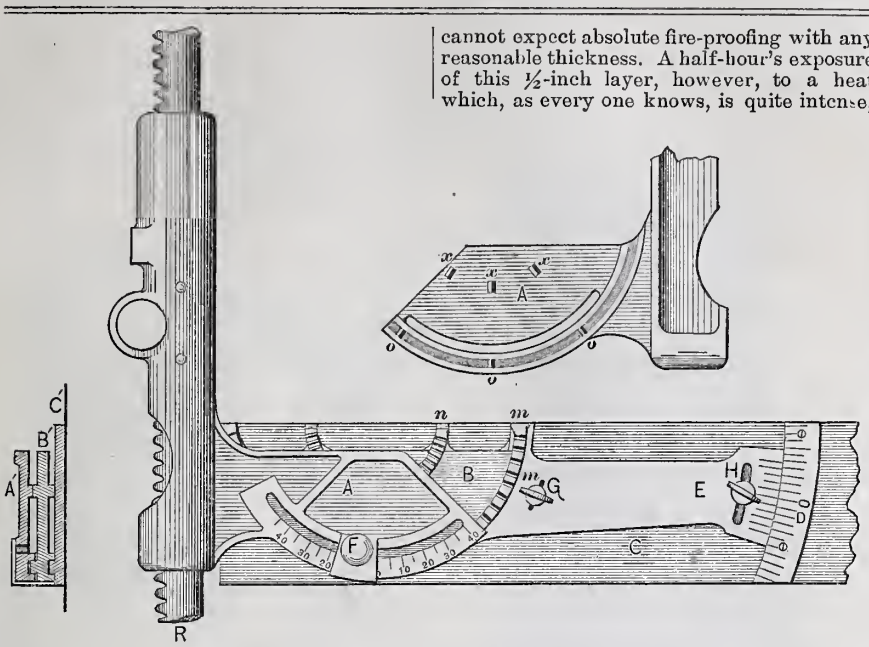



*Fig. 5.—Reduced Fac Simile of a Graduated Circle Printed on Cardboard and Used in Shading Cylindrical Bodies.*

facturers, and have been carefully derived from the correct shading of cylinders. Their use with this tool greatly facilitates certain mechanical drawings. They are held in place by the binding screw B'', and all that is necessary to do in shading cylindrical parts is to bring the point *n*, terminating the spring G in Fig. 3, against the several division marks in the paper disk shown in Fig. 7, and to draw the line when the blade is in this position.

On the blade of the square in Fig. 1 is shown a paper scale fastened in position, and an attachment on the triangle in the shape of a pointer laying down over the blade and coming against one of the division marks upon it. Another application of the same principle is shown in Fig. 6, where a paper scale is represented not only upon the blade of the square, but also upon the end of the board and pointer, being attached to the head of the T-square, and also to the triangle. It is hardly necessary to call the attention of architectural draftsmen to the utility of an arrangement of this kind in measuring distances in a drawing. Having the scale to which the drawing is made upon the board and T-square in this manner, the sizes of different rooms in a floor plan, for example,




*Novelties.—Fig. 6.—Improved Swiveling Device Used in Connection with Larger Sizes of T-Squares of the Kind Shown in Figs. 1 and 2.*

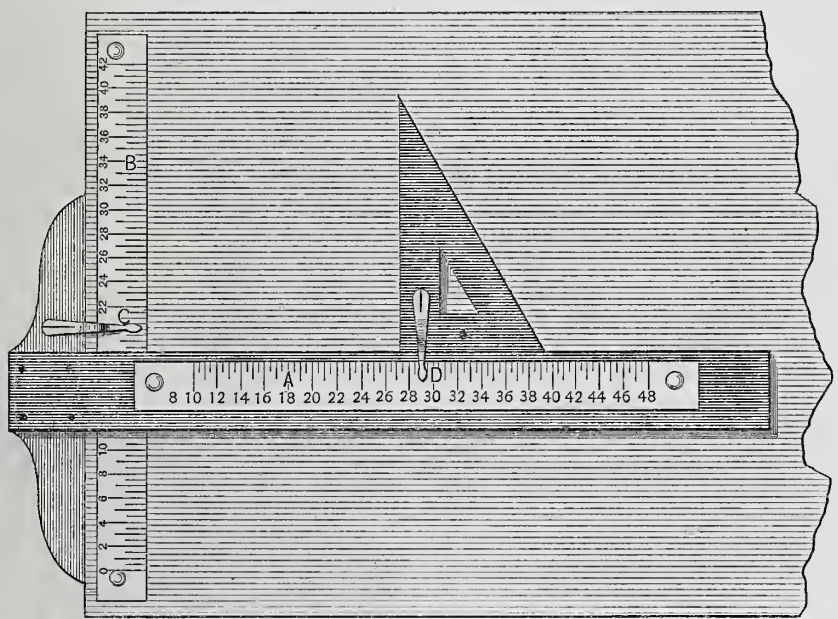



*Fig. 7.—A Novel Measuring Device Adapted to the Use of Architects and Draftsmen Generally.*

or any other dimensions, are much more readily laid off than would be possible in the ordinary manner by the use of a scale and pair of dividers. Still another improvement which Messrs. Gardam & Son have recently perfected is a T-square with a glass blade. The advantages of a tool of this kind will readily be perceived by those of our readers who have drafting to perform. The ability to see through the blade gives the draftsman a knowledge at all times of the lines lying beneath it, and which would otherwise be covered by the blade of his T-square. Thus it saves many shiftings of that instrument. The construction employed is such as to make the tools comparatively cheap, and to make it possible to replace the blade at very small cost in the event of fracture by accident.

### Fire-Proof Material.

The Magneso-Calcite Company, of 72 Sudbury street, Boston, Mass., have just issued a pamphlet describing a new fire-proof material which they are making for a variety of purposes and have applied very extensively to the lining of fire-proof safes and the making of bond, deed and other document boxes which are intended to preserve their contents from the action of fire. Not long ago we obtained a sample of this material and submitted it to a severe test, using an argand burner and placing the slab within about an inch of the top of the chimney. No material is an absolute non-conductor, and we cannot expect absolute fire-proofing with any reasonable thickness. A half-hour's exposure of this ½-inch layer, however, to a heat which, as every one knows, is quite intense, only produced charring through half of the thickness, and from the rate at which charring took place it would have required more than an hour and a half of the same heat for it to penetrate to the inside. Even then it must be remembered that the contents of the box made of such material would not be destroyed until the whole interior had been heated up to the same temperature. As a material for deadening walls and floors, for taking the place of plastering and of lining, we should judge this would be of great value. A fire would rage upon one side of it for a long time before sufficient heat would be transmitted to the opposite side to cause the woodwork to ignite.

### The Allard Spiral Screw-Driver.

In Fig. 8 of the engravings we show a spiral screw-driver, manufactured by Mr. F. A. Howard, of Belfast, Me. This screw-driver is designed especially for light and rapid work, and for the use of those mechanics who have large quantities of small screws to drive. For work of this kind it is very valuable, saving many times its cost in a very short time. The peculiar arrangement of parts is such that the screw-driver may be used not only for driving a screw, by pressing against the handle, and thus employing the spiral shank, but it may be also used as a common screw-driver for driving and drawing out screws. In use, the handle is grasped in the right hand, the neck of the shank being held between the thumb and forefinger of the left hand. The point is placed in the nick of the screw, and, while being held, the handle is gently withdrawn. The shank is then released slightly and the handle pressed forward. This causes the screw-driver to revolve, and at once sends the screw home. For withdrawing a screw the shank is pressed into the handle, when it may be used as an ordinary screw-driver. The tool also may be used as a common screw-driver with the shank extended, by simply giving the shank a twisting jerk, which causes the nut to recede and become locked. These goods are sold through the hardware trade, and also sent by mail by the manufacturer.

*Fig. 8.—Spiral Screw-Driver.*

### Double Blind-Slat Planing Machine.

A new machine designed to meet the wants of blind-makers and others who are interested in small, nice planing for special purposes, where both quality and quantity are desirable, has been designed by Mr. H. A. Lee, of Worcester, Mass., and is represented in Fig. 9 of our engravings. This machine will plane four sides of a piece at one time, whether the article be square or a flat piece

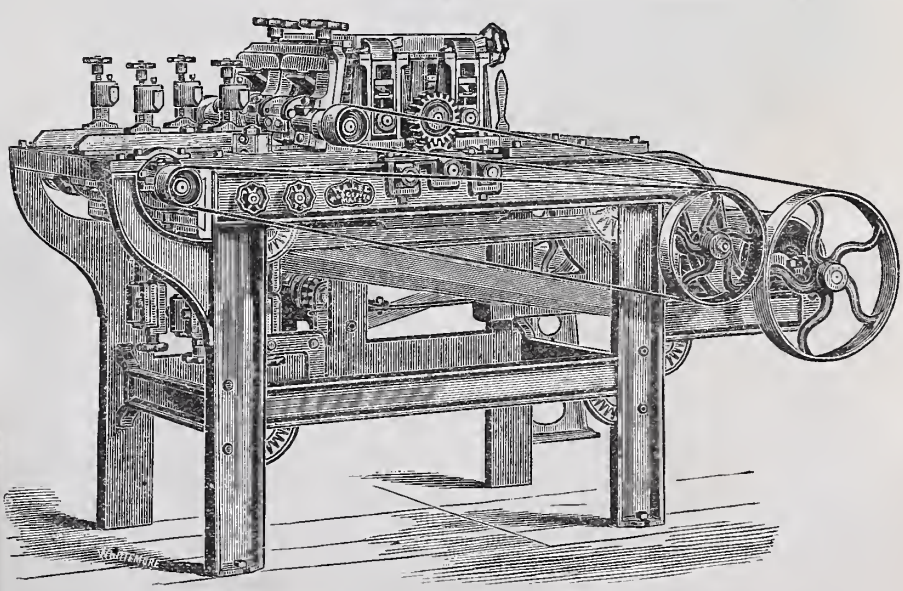
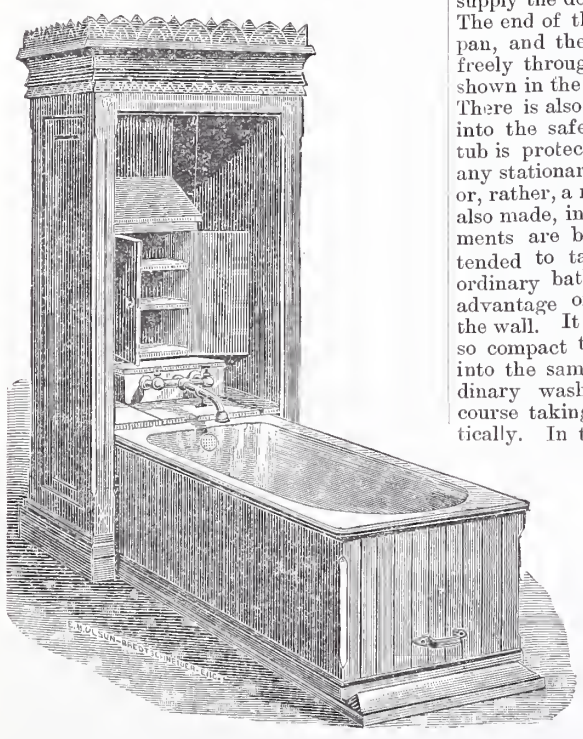


*Fig. 9.—Double Blind-Slat Planing Machine.*

like the slats of a blind. It will also plane a piece thicker on one edge than the other, and with one or both edges rounded, like a curtain stick. Its capacity ranges from 3 inches wide aud 1 iuch thick down to the smallest pieces that would be required. Further, it can be used to plane two differeut widths and thicknesses at the same time. All the cutters operate at an angle to the line of feed, thus insuriug smooth work and reduciug the danger of slivering. Stuff 3 inches wide and 1 inch thick is delivered from the machine at the rate of 60 feet per minute. It is well calculated for all light work, such as blind slats, curtain slats, parting beads for window frames, &c. Iu the design of this machine special care has been taken to make all of the working parts of proper strength to withstand the strain brought upon them. The frame has been made open, so that shavings may be cleared away without interference with its running parts. The manufacturer states that the peculiar styles of steel heads and cutters employed in this machine, running at a high rate of speed, together with powerful feed and the workmanship with which all have been arranged, are guarantees of good work. He states further that it will do double the work of other planers, and do it better. The driving pulleys are 4 x 10 inches, making 775 revolutions per minute. The weight of the machine is about 1400 pounds.

### Folding Bath Tub.

Figs. 10 and 11 show a new folding bath tub made by the Chicago Folding Bath Tub Company, 119 Twenty-second street, Chicago, Ill. Fig. 10 represents the tub open ready for use. It will be seen that it is very similar iu form to an ordinary tub, but projects out into the room instead of standing in the corner. It is made in such a way that it can be used without water connections if so desired, or can be arranged to be used with hose connections where this is practicable. Some of the advantages of this form of tub can be seen at a glance; for example, iu Fig. 11 the bath is shown with the cabinet closed, and the apparatus takes but little more space than an ordinary wardrobe. Another advantage, after the convenience of space, is that it enables one to have a bath tub in his own chamber, thus avoiding the dangers or inconvenience of passing from one room to another aud of changes of temperature, and also having a bath in a warm room. The tub is in one sense strictly portable. It can be prepared for removing from one house to another by simply unscrewing the pipes and their couplings. The tub is supported by a cord attached to each extremity uear the top, passing over and under pulleys, and finally attached to a weight. This is made of sufficient size to equal the resistance of the tub at each stage of the opening and closing. The supply pipes connecting with the main pipe are underneath the tub and supply the double faucets shown in Fig. 10. The end of the tub is hinged to the iron safe pan, and the discharge pipe, which works freely through a packing orifice, is curved, shown in the small sectional view at the top. There is also an overflow, which discharges into the safe. When closed, of course the tub is protected from the injuries to which any stationary tub is liable. Another form, or, rather, a modificatiou of the same form, is also made, in which the tub and its attachments are built into a recess. This is intended to take the place of the ordinary bath tub, and has the advantage of folding flush with the wall. It is said that these are so compact that they can be put into the same space that an ordinary wash-bowl occupies, of course taking up more room vertically. In this style the bottom of the tub is furnished with a mirror, so that when it is in place there seems to be nothing on the wall but a large mirror frame.



*Novelties.—Fig. 10.—Folding Bath Tub.—Open.*

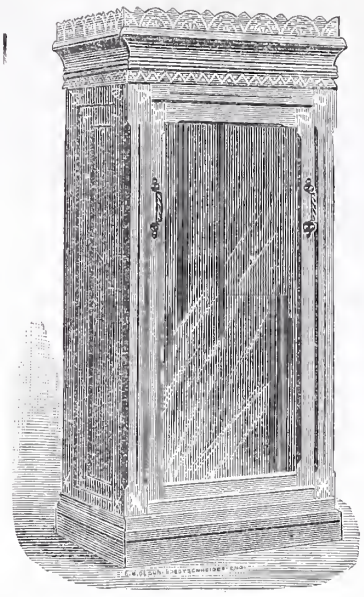


*Fig. 11.—Appearance of the Folding Bath Tub When Closed.*

### Inside Catch for Bookcases, Cupboards, &c.

Fig. 12 shows an improvement in the method of fastening the left-hand doors of bookcases, wardrobes, cupboards, sinks and the like, which is being offered by Messrs. North Brothers, of Philadelphia, Pa. The idea of the invention is to dispeuse with hooks and bolts for fastening the left-hand doors, and to produce a catch that is self-locking. As may be seen by the engraving, the catch is automatic in its action, and thus overcomes the annoyance of locking and bolting the door after it is closed. In applying this fasteniug the only tool needed is a screwdriver, its construction being such that mortising is dispensed with. It consists essentially of two parts, one fasteuing to the ceiling of the cupboard and the other to the door. There is sufficient play in the tongue of the catch and in the action of the spring to admit of its operation after the usual shrinking that takes place in the construction of cupboards has occurred. The left-hand door is opened by merely touching the thumb-piece which projects to the front in the engraving. We understand that cabinet manufacturers and those fitting up pantries aud closets who have examined this article have been very much pleased with it. On account of the small dimensions of the catch itself, the engraver had found it necessary to represent it somewhat exaggerated in size in the cut. The dimensions of the body of the catch are a little less than 1 inch each way, and about ¼ inch in depth. These particulars will give our readers a better idea of its geueral desirability than would be derived from the eugraving alone.

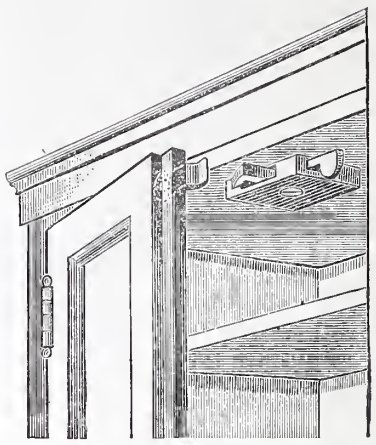


*Fig. 12.—Inside Catch for Bookcases, Cupboards, &c.*

### Empire Spring Hinge.

There is probably no article in the hardware trade that has passed through more different phases of existence than spring hinges. A short time ago, comparatively, the only demand for them was for use upon storm doors aud upon double-acting doors in office vestibules. Some ten years since, when wire cloth was greatly cheapened from the prices it formerly commanded, a

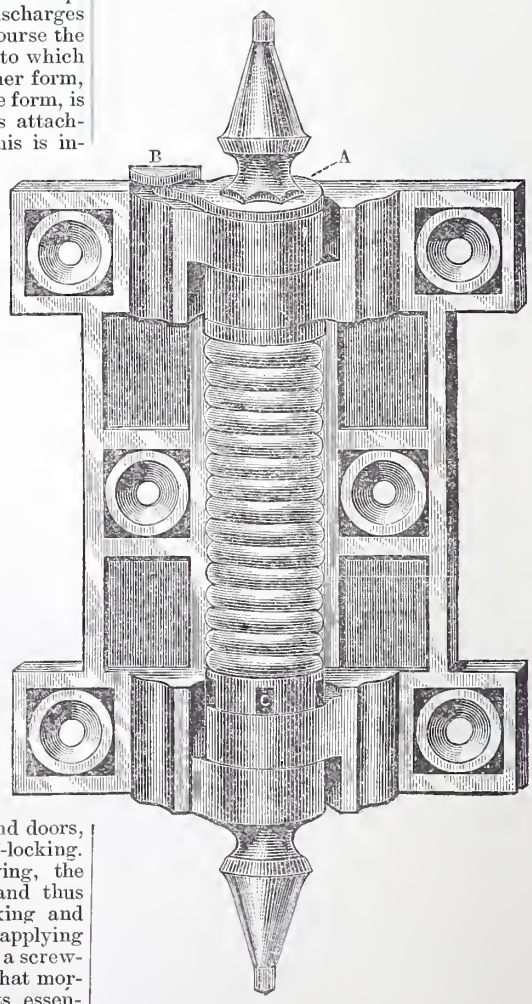
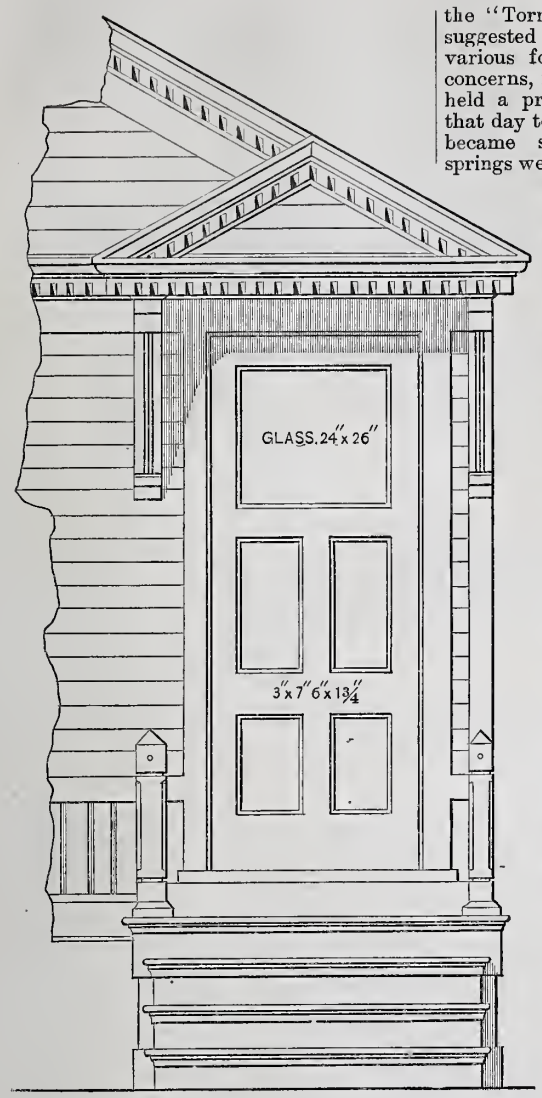



*Fig. 13.—Single-Acting Empire Spring Hinge.*




*First Prize Design, Eleventh Competition.—Fig. 22.—Front Elevation of Rear Entrance.—Scale, ⅜ Inch to the Foot.*

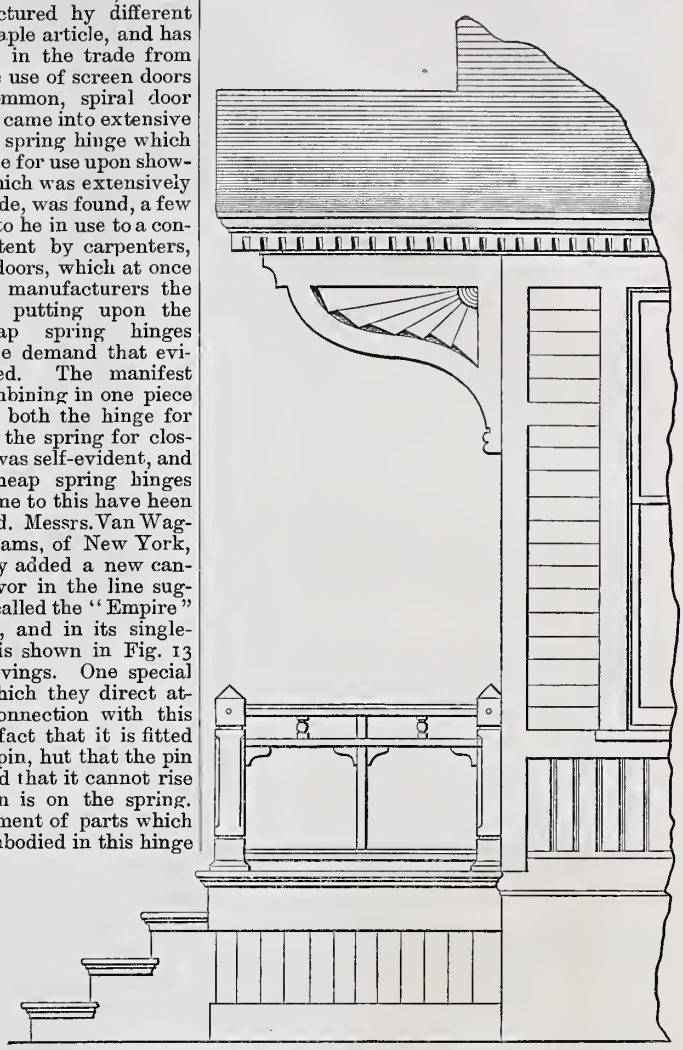


*Fig. 23.—Side Elevation of Rear Entrance.—Scale, ⅜ Inch to the Foot.*

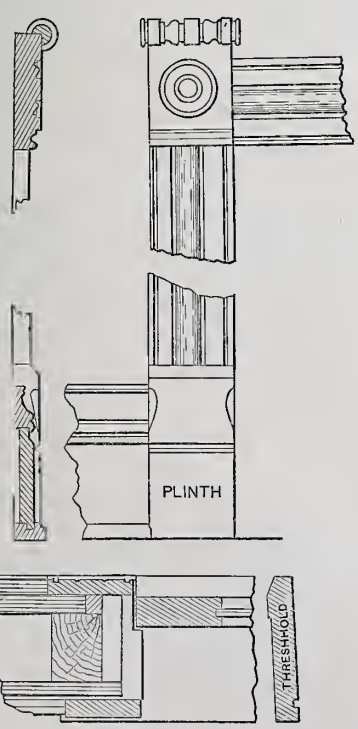



*Fig. 24.—Detail Inside Trimming, Showing Vertical Section of Baseboard and Horizontal Section Through Door, with Section of Threshold.—Scale, 1 Inch to the Foot.*

demand sprung up for some means of making screen doors automatic in action. The rod door spring, commonly known as the "Torrey," was one of the first devices suggested for purposes of this kind, and in various forms, manufactured hy different concerns, it became a staple article, and has held a prominent place in the trade from that day to this. As the use of screen doors became still more common, spiral door springs were devised and came into extensive use. A light spring hinge which had been made for use upon show-cases, and which was extensively sold in the trade, was found, a few years since, to he in use to a considerable extent by carpenters, upon screen-doors, which at once suggested to manufacturers the propriety of putting upon the market cheap spring hinges adapted to the demand that evidently existed. The manifest utility of combining in one piece of hardware both the hinge for the door and the spring for closing the door was self-evident, and numerous cheap spring hinges from that time to this have heen manufactured. Messrs. Van Wagoner & Williams, of New York, have recently added a new candidate for favor in the line suggested. It is called the "Empire" spring hinge, and in its single-acting form is shown in Fig. 13 of the engravings. One special feature to which they direct attention in connection with this hinge is the fact that it is fitted with a loose pin, hut that the pin is so arranged that it cannot rise when tension is on the spring. The arrangement of parts which they have embodied in this hinge permits a spring of larger diameter than is ordinarily used in hinges of its class, thus giving increased power. By examination of the engraving it will he seen that the tension of the spring is regulated hy the locking-ring A, which fits over the end of the pintle at the top. As the spring is wound up by turning the ratchet C with a common nail to the right, the locking-ring is lifted and turned as many spaces as may he required, and then dropped into place aga'n, so that the projection rests against the flange B. Messrs. Van Wagoner & Williams are manufacturing this spring both single-acting and double-acting, and both mortised and surface. They are finished in walnut bronze and copper bronze. The style shown in the engraving is a surface hinge adapted for screen doors only.

## First Prize Design, Eleventh Competition.

We submit to our readers herewith the remainder of the details of the seven-room house awarded the first prize in the Eleventh Competition, the perspective and elevations of which, together with part of the details, were given in our last number. The architect is Mr. Frank J. Grodavent, of Syracuse, N. Y. He has given the same care and attention to all the parts of a cheap house that is ordinarily hestowed upon houses costing many times the value of this. Some of the details given herewith will be found useful hy our readers in their regular work, whether a house to this particular design is being built or not; for example, the mantels are of a character to he used in a great many different places with satisfaction. The inside finish of the dining-room, a door and window in which are given in Figs. 29 and 30, is also of wide application. The stair rail and haluster details, which appear in Figs. 31, 32, 36 and 38, are also of a character to he generally useful.

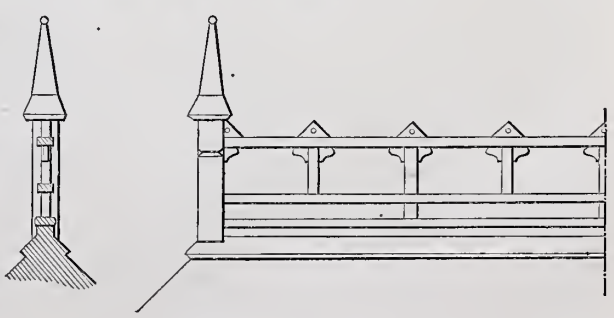


*Fig. 25.—Detail of Cresting on Ridge.—Scale, ⅜ Inch to Foot.*

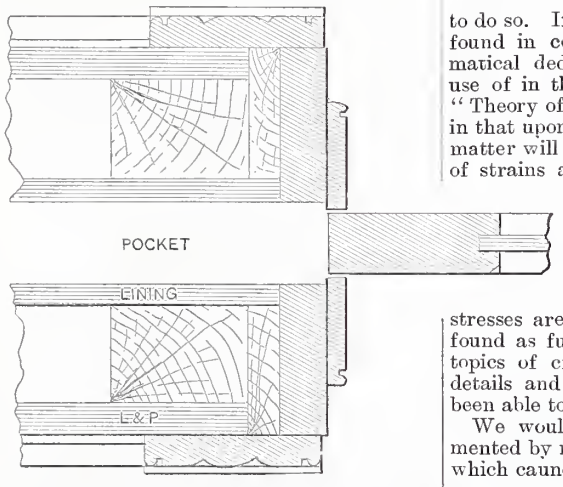
## NEW PUBLICATIONS.

THE STRAINS IN FRAMED SRUCTURES. By Prof. A. J. Du Bois. Published by John Wiley & Sons. Size, 9¼ x 12 inches; 390 pages; illustrated. Price, $10.

Probahly few publications that have thus far reached us have appeared in a more attractive form than Professor Du Bois's new work on framed structures. The general arrangement and classification adopted are all that can he desired, and will he understood hy a perusal of the appended extract from the author's preface:

"The work is divided into two parts, Part I consisting of two sections. Section 1 gives in four short chapters the principles

which lie at the bottom of all methods of calculation. In these chapters all unnecessary detail has been avoided, the object being to familiarize the student first with the fundamental principles. Each chapter contains the groundwork of a separate method of calculation, and the same illustrative example is used in each. The student who has thus familiarized himself with the four fundamental methods of calculation can afterward combine these methods in the solution of any particular case as may seem best. It is believed that every method in use will be found, on analysis, to be a combination of two or more of the methods set forth in these first four chapters, and, so far as known to the writer, the present work is the only one in which such division has been made and each method given clearly by itself independently of the others. In Section 2 the application of these methods to the solution of various structures is given with all necessary detail. It has been the aim of the writer to make this section very complete in full solutions of every existing form of bridge. The student already familar with the four fundamental methods is now in no danger of being confused by detail, and can easily devise for himself other methods of solution for individual cases as good or even better than those given. In Chapter I of this section will be found a more complete treatment of roof trusses than has been thus far given in any work known to the writer. In Chapters III and IV a simple bridge girder is taken and calculated fully—first, by




*First Prize Design, Eleventh Competition.—Fig. 26.—Horizontal Section Through Sliding Doors.—Scale, 2 Inches to the Foot.*

each of the four fundamental methods, and, lastly, by that combination of methods which seems best adapted to the case in hand. The remainder of the section gives the complete calculation of every form of bridge known, each case illustrated by an example carefully worked out. In Chapters VI and VIII, upon the continuous girder, pivot or swing bridge and braced arch, much new matter will be found, and it is thought that the methods given will commend themselves as practical and easy of application. Whatever may be thought of the comparative advantages or disadvantages of these forms of bridges, they cannot well be omitted from a work which aims at any degree of completeness. For the average student perhaps so full a course is not desirable, at least at first, and therefore the attempt has been made by means of finer print to mark out two courses of study. In any case, the inteligent teacher will know what to omit, and it is no disadvantage to a student to be possessed of a text-book which includes more than he has been able to read, and which may, therefore, be of future benefit, instead of being laid on the shelf when finished. In Chapter IX the suspension system is given at considerable length, perhaps more than its importance demands. The entire chapter is believed to be new, and it is perhaps the only solution of this construction which is free from assumptions known to be false. It is, therefore, given here for what it is worth as a contribution to the science of bridge calculation. In the supplement to Chapter IX the ordinary theory is also given with all requisite fullness. Everywhere it has been the aim of the writer to keep mathematical demonstrations out of the body of the work so far as possible to do so. In the appendix to Part I will be found in connected form all the mathematical deductions referred to and made use of in the text. The chapter upon the "Theory of Flexure" is especially full, and in that upon the "Continuous Girder" new matter will be found. The mere calculation of strains alone is but one part of the general problem of design, and by no means the most important. It is quite as necessary to properly proportion a structure for the stresses it has to sustain as to know beforehand what these stresses are. In Part II, therefore, will be found as full a treatment of the important topics of cross-sectioning and designing of details and connections as the author has been able to give.

We would add that the text is supplemented by numerous illustrations and plates which cannot but be of interest and service to the student. Not the least interesting portion of the book is that devoted to specifications and contracts, the particulars given having been compiled from a careful comparison of those furnished by a large number of railroad and bridge engineers. The whole work betrays an unusual amount of care and skill in its execution, and should justly be classed among the desirable adjuncts of an engineer's library.

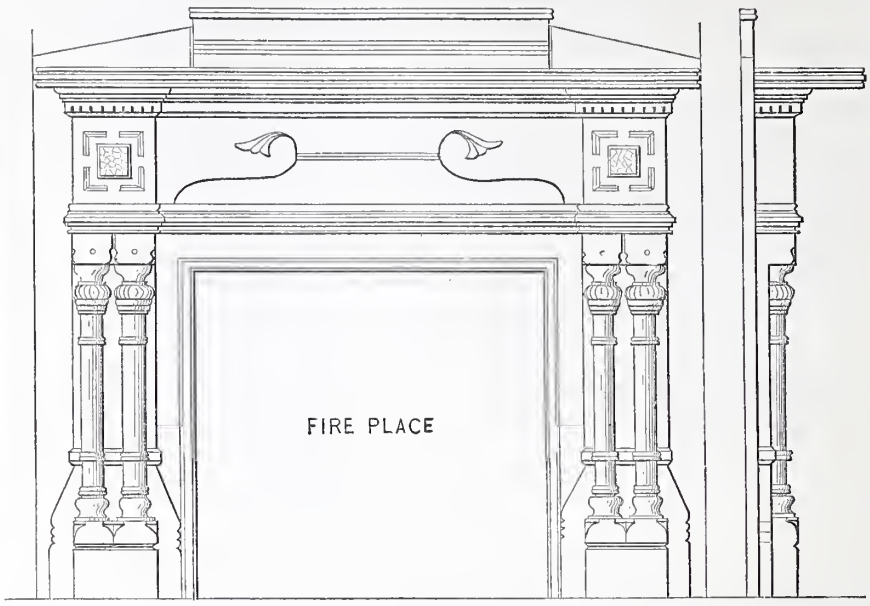



*Fig. 27.—Elevation and Section of Parlor Mantel.—Scale, ¾ Inch to the Foot.*

STEEL SQUARE PROBLEMS; Together with a Number of Geometrical Demonstrations of Practical Value to Mechanics. By Lucius D. Gould. Published by the author. 5½ x 7 inches in size; 108 pages; 60 engraved plates; bound in cloth. Price, $1.

This is a revised and somewhat enlarged edition of a work by the same author published some time since and bearing the same title. It reaches us through the well-known publishing house of William T. Comstock. The work is intended to give explicit directions for an easy solution of the many problems that frequently vex builders in the prosecution of their work. The problems considered are such as finding the lengths and angles for butting braces, rafters, &c., mitering hoppers of various numbers of sides and of different elevations; finding angles for mitering polygons of different numbers of sides; joining, raking and level moldings, &c. The large amount of attention given the steel square in the technical press during the past three or four years has made it incumbent upon various authors to bring their works up to date; accordingly, a number of revisions have been issued. There is not very much in the present book that will be

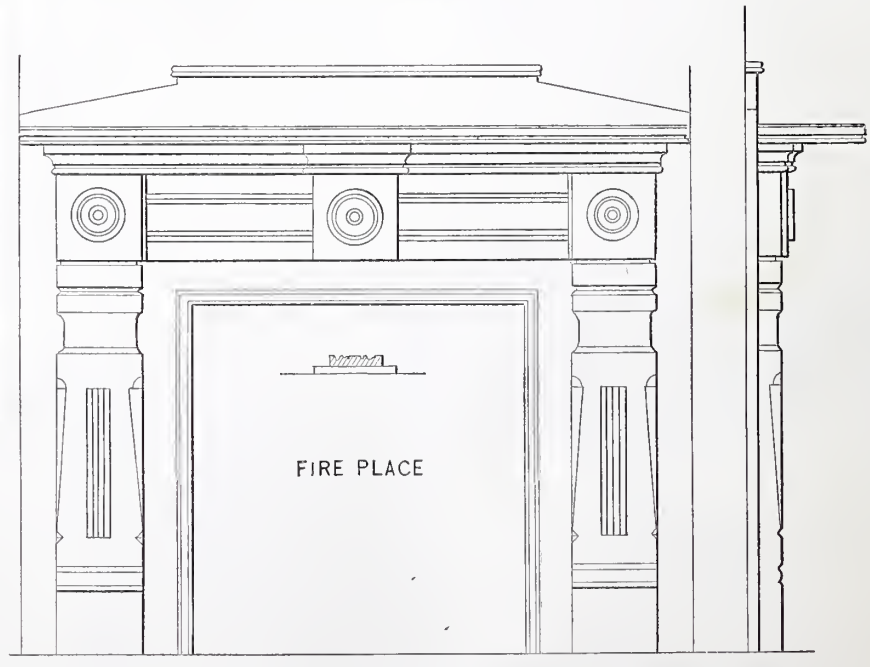
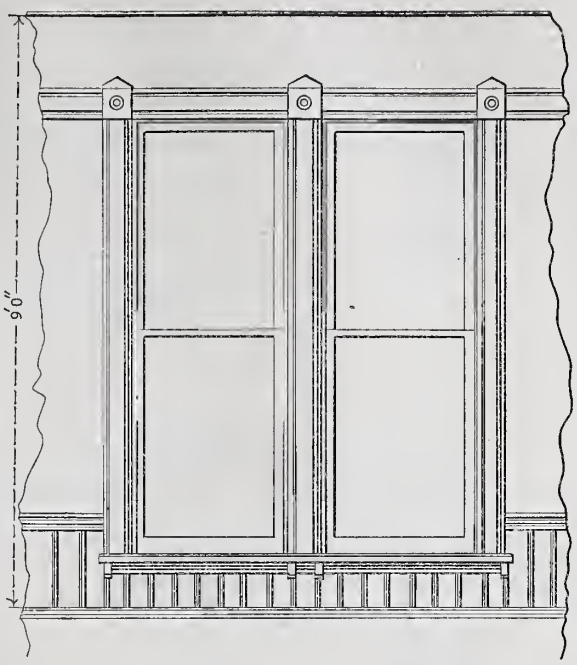



*Fig. 28.—Elevation and Section of Sitting and Dining Room Mantels.—Scale, ¾ Inch to the Foot.*

new to the readers of *Carpentry and Building*, for the steel square has been so thoroughly presented in our pages in the past that any compilation of problems in book form at the present time, to be at all complete, must include much of what we have previously done. While, by its title, this work pretends to be an exposition —to some extent, at least— of the use of the steel square in the practical operations of framing, it is far from exhaustive in that direction, and gives us the opportunity of saying, what we have already remarked in these pages, that the book fully explaining the use and applications of the steel square remains yet to be written. The work before us, however, is convenient in shape, and is among the best now published. It deserves a large sale and should be found in the chests of practical mechanics who have occasion to do work of the kind enumerated in the above schedule, ready for reference when wanted.




*First Prize Design, Eleventh Competition.—Fig. 29.—Elevation of Window in Dining-Room, Showing Finish.—Scale, ⅜ Inch to the Foot.*

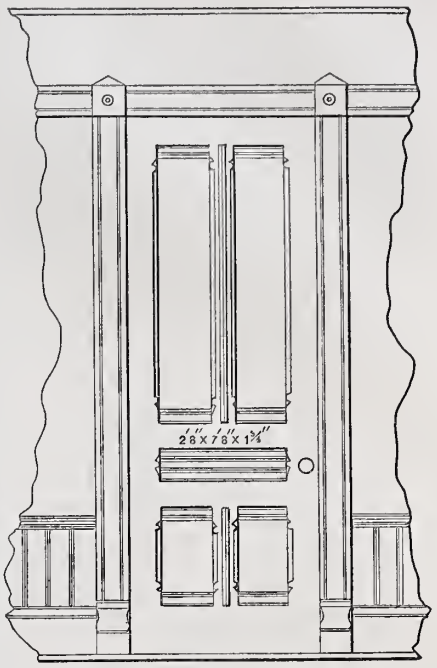



*Fig. 30.—Elevation of Door in Dining-Room. —Scale, ⅜ Inch to the Foot.*

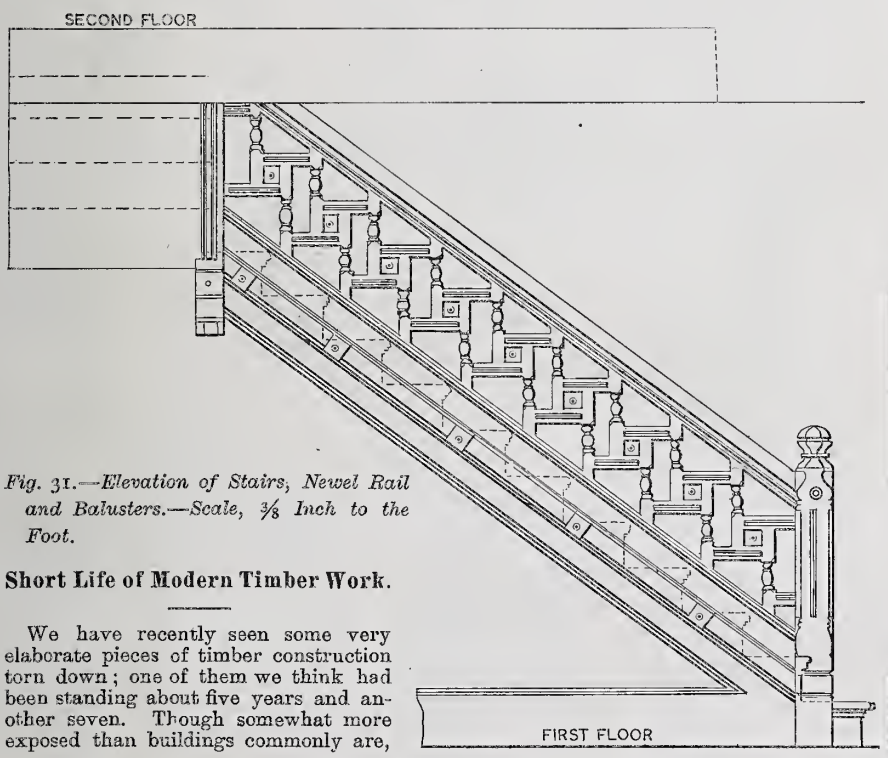



*Fig. 31.—Elevation of Stairs, Newel Rail and Balusters.—Scale, ⅜ Inch to the Foot.*

## Short Life of Modern Timber Work.

We have recently seen some very elaborate pieces of timber construction torn down; one of them we think had been standing about five years and another seven. Though somewhat more exposed than buildings commonly are, we think that the short life which they have had is altogether without excuse. Some of the timber taken down, which had not been entirely exposed to the weather, was so rotten that a mere shell remained on the outside. Timber work has been exceedingly fashionable for the last few years, and a good deal of it has been put up both for private dwellings and also for manufactories. The architects point to the fact that in the Old World, notably in England, Switzerland, Norway and Sweden, timber houses are to be found which are hundreds of years old, and are still in good preservation. In drawing examples from foreign countries it is always well to consider carefully not only the foreign examples, but the foreign conditions, and to find whether the same conditions prevail at home as well as abroad. It used to be the fashion for every health reformer to tell American women that they ought to walk miles in the open air every day; that their English sisters did it, and it was consequently the only means by which they could hope to obtain robust health. But these reformers forgot that in this country we com-

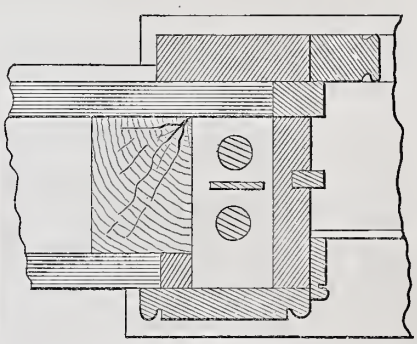


*Fig. 33.—Horizontal Section Through Window Frames.*

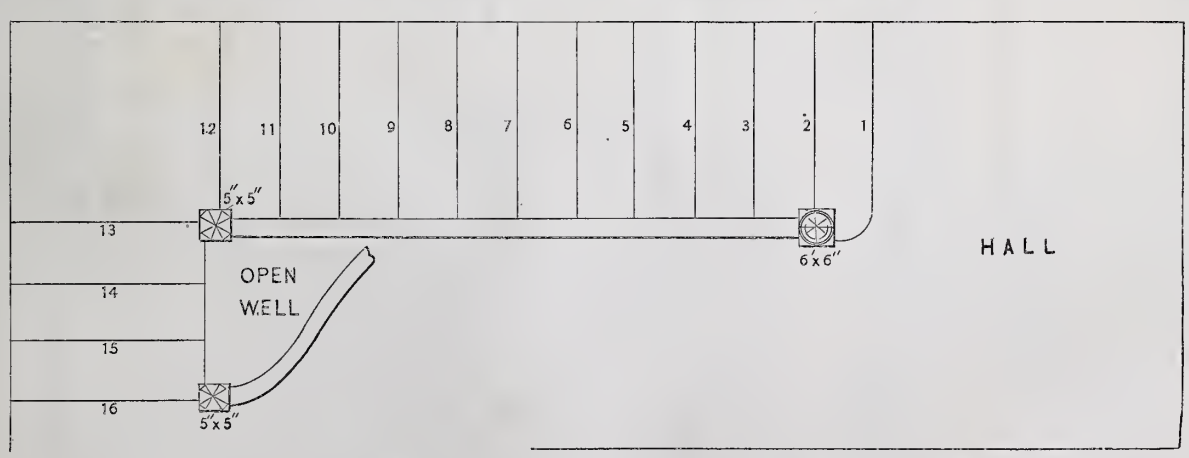
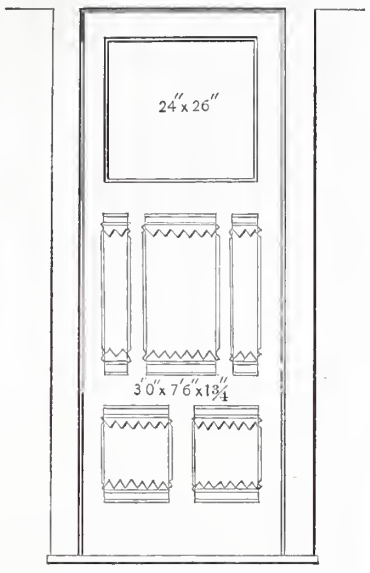



*Fig. 32.—Plan of Stairs and Front Hall.—Scale, ⅜ Inch to the Foot.*

bine both a tropical and an arctic climate. No one would think of exercising outdoors in India during the hot weather, nor would it be considered prudent for natives of India to take exercise in the open air in an Arctic climate. These same conditions of climate which force us to take our exercise differently from the English also compel us to build our houses, our mills and our workshops in a very different manner, and to provide for numerous contingencies which are not felt abroad. We cannot use timber construction




*First Prize Design, Eleventh Competition.—Fig. 34.—Elevation of Front Door.—Scale, ⅜ Inch to the Foot.*

out of doors in this country safely. We need weather-boarding or its equivalent to protect our timber work from the climate.

Wooden pavements have lasted longer in London than in most of our American cities, but they are now being abandoned even there, chiefly because of their absorption of moisture and dirt, the latter being given off again in fine dust when the pavement dries. Chicago also is substituting cobbles and stone blocks for wooden pavements. Vast sums of money were wasted in experiments with these patent pavements, and each city, instead of profiting by the experience of others, had to pay for its own. Money is being wasted in similar fashion with cobble-stone pavements here and elsewhere. One chief objection to cobble stones is a sanitary one. The pavements made of them cannot be kept clean, and the interstices are likely at all times to be filled with decaying animal and vegetable matter. When to this serious objection is added that of extra cost in attempted repairs and cleaning, extra cost to owners of vehicles in repairs thereto. and general nuisance of jolting and noise, the cobble-stone pavement becomes dear at any price. It would be better to leave new streets unpaved for a year or two longer, until a good pavement can be laid, rather than to waste money in laying cobbles, except as a foundation for a better surface. In some quarters the latter plan could be followed to advantage, the level of the street being kept, say, a foot below its ultimate grade until building improvements and the growth of the city justified regrading and repaving directly upon the surface of the old pavement, which might then become the foundation of the new.

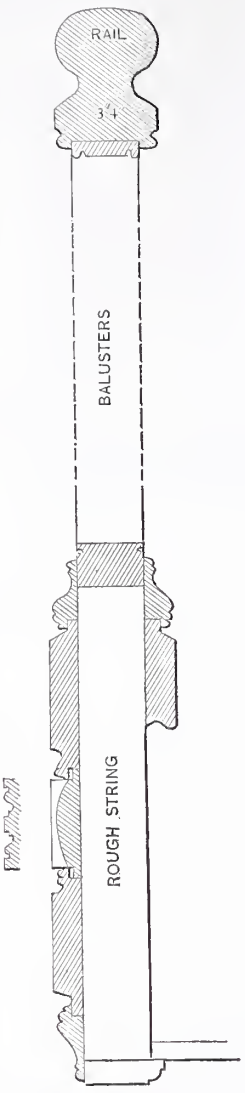



*Fig. 36.—Vertical Section Through Rail and Front String of Stairs.—Scale, 2 Inches to the Foot.*

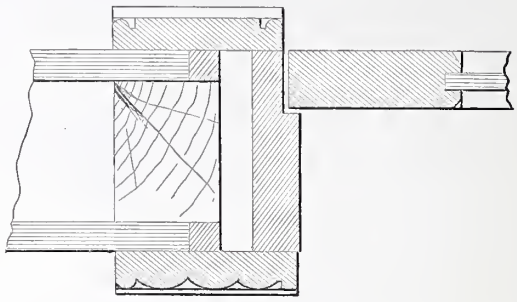


*Fig. 37.—Section Through Door Frame Between Sitting-Room and Dining-Room.—Scale, 2 Inches to the Foot.*

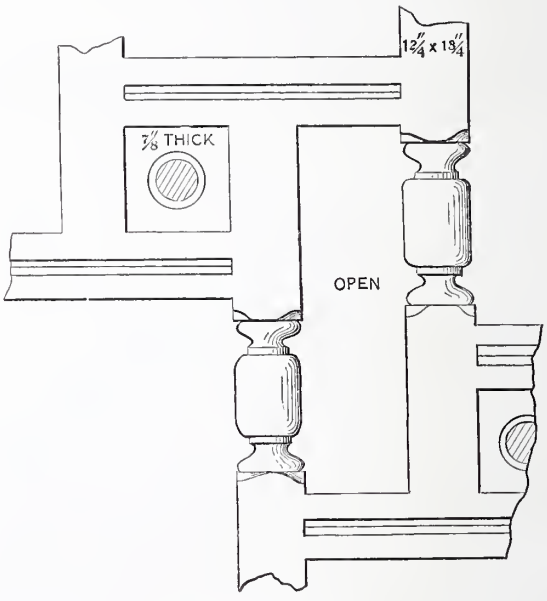



*Fig. 38.—Detail of Balusters.—Scale, 2 Inches to the Foot.*

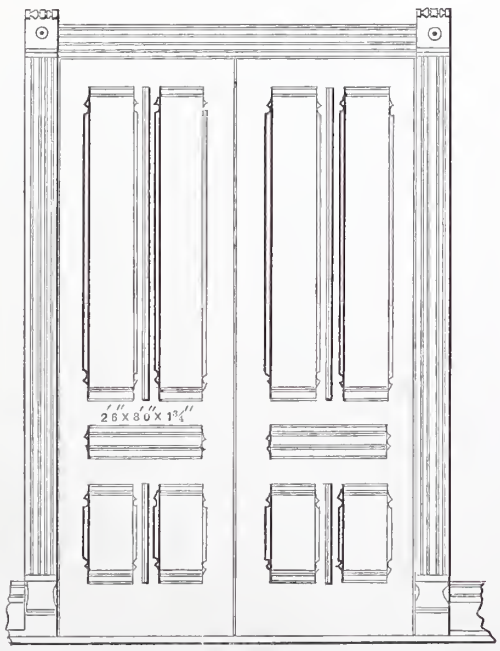



*Fig. 35.—Elevation of Sliding Doors.—Scale, ⅜ Inch to the Foot.*

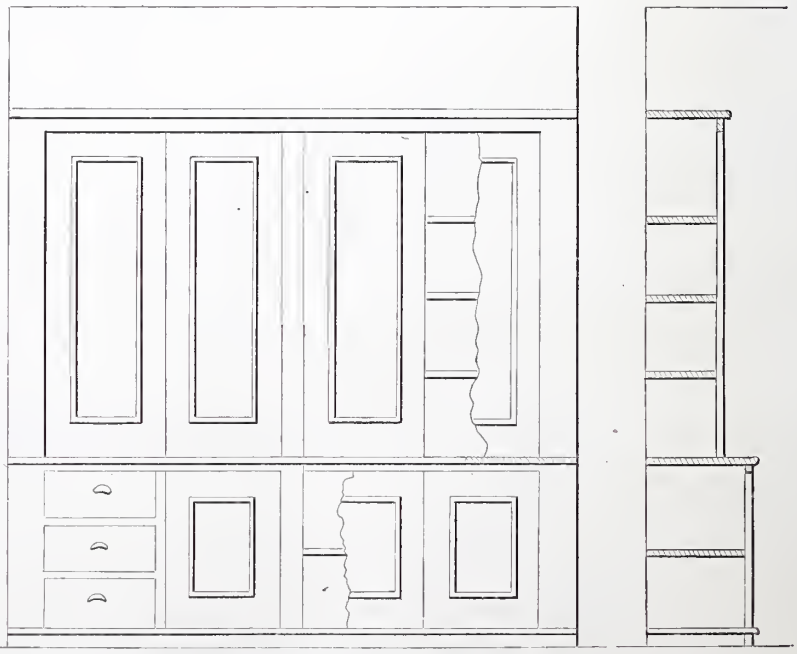


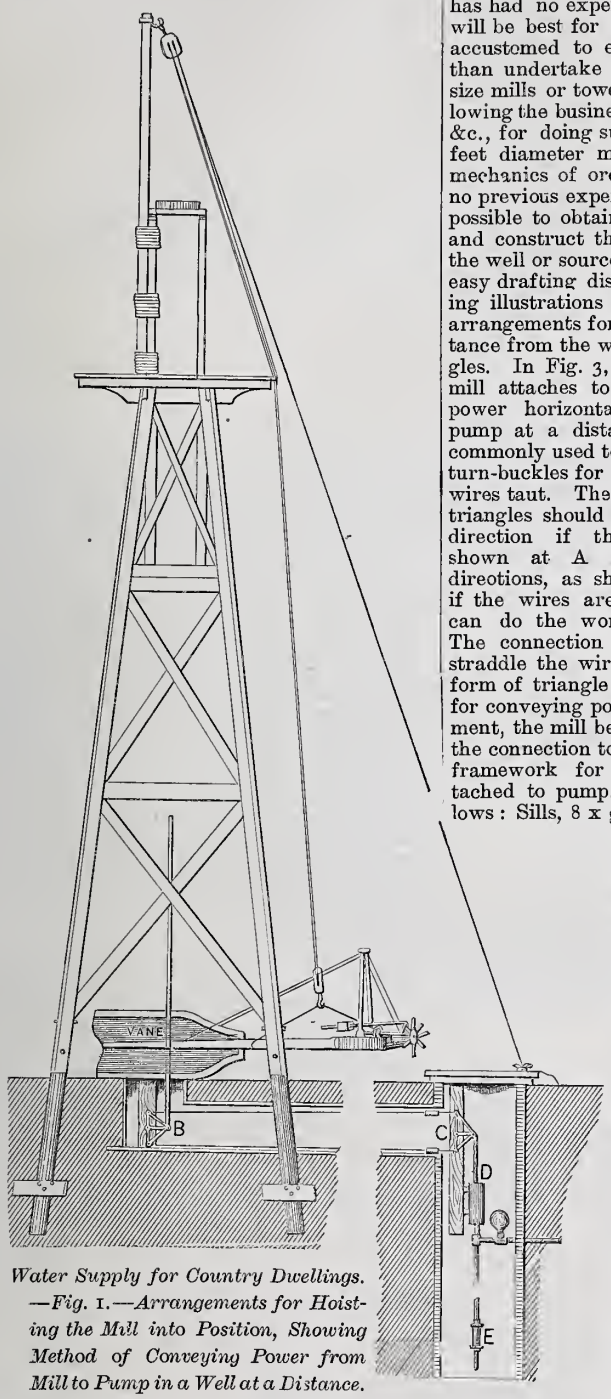
*Fig. 39.—Elevation and Section of Pantry Shelving.—Scale, ⅜ Inch to the Foot.*

## Water Supply for Country Dwellings.

BY A COUNTRY PLUMBER.

V.

When the tower is finished and bed-plate leveled and made fast (be certain that it is positively level, for the ease with which the mill will head to the wind depends on its having a level bearing) the mill may be mounted to position. Direotions for putting together generally accompany the mill from the factory. An excellent way to mount it is to put together on the ground as much of it as can be raised with pulley-blocks and rope, which, if the mill is not over 14 feet in diameter, will include the turn-table, shaft and spider, vane and truss, if the mill has such. Placing the vane in position after the iron work is on is the most difficult task when putting a mill together and not unattended with danger. By adopting the following plan, difficulty and danger are overcome: Secure a "gin" pole to the masts by lashing fast Fig. 1 sufficiently high and strong to bear the strain of hoisting the parts already named from the ground directly on to the bed-plate. Make a pulley-block fast to the top of the pole; attach the other to the mill as nearly over the turn-table as the mill will balance. Use a small line attached to the mill, if you have one, to steady it as it rises. When on the table, clamp it fast, and get the "gin" pole away quickly, if wind is blowing, as the mill cannot turn on the table while it is there. Then see that the mill will turn readily on the table. The other parts may be put on at leisure.




*Water Supply for Country Dwellings.—Fig. 1.—Arrangements for Hoisting the Mill into Position, Showing Method of Conveying Power from Mill to Pump in a Well at a Distance.*

These directions will apply generally to mills of various sizes and kinds, but if the reader has never seen a mill larger than 14 feet mounted on a tower and put together, or has had no experience in a similar task, it will be best for him to engage some person accustomed to erecting windmills, rather than undertake the erection of the larger size mills or towers for them. Persons following the business have the necessary tools, &c., for doing such work. Mills under 14 feet diameter may be readily orected by mechanics of ordinary skill who have had no previous experience. Sometimes it is impossible to obtain a good exposure to wind and construct the mill tower directly over the well or source of water supply, or within easy drafting distance. In the accompanying illustrations are shown three different arrangements for operating a pump at a distance from the windmill by means of triangles. In Fig. 3, A is the point where the mill attaches to a triangle for conveying power horizontally above ground to the pump at a distance, telegraph wire being commonly used to connect the triangles, and turn-buckles for adjusting and keeping the wires taut. The horizontal arms of the two triangles should stand pointing in the same direction if the wires are parallel, as shown at A and L, or in opposite direotions, as shown at M and N, Fig. 2, if the wires are crossed, so that the mill can do the work on the upward stroke. The connection at H, Fig. 3, is made to straddle the wire. In Fig. 2 is shown the form of triangle and arrangement of wires for conveying power down a hill or embankment, the mill being attached at M, N being the connection to pump. In Fig. 3 is shown framework for holding the triangles attached to pump. It is constructed as follows: Sills, 8 x 8 inches, are laid ⊺ shape; an 8 x 8 inch post is erected sufficiently high to carry the wires above all obstructions. The post should be plumb and secured firmly by braces on the sides and back, and an oblong hole mortised in the top, large enough to allow the triangle to work freely. The post in tower to which triangle A is secured is also mortised for the triangle. The sills are supported and anchored at their outer ends by posts bolted to them, set in the ground with bases spread, and pieces of plank spiked across them. A view of the posts and end view of the sill is shown at K. The wires should be supported and guided every 30 or 40 feet. A light frame-work or post, securely erected, with small side pulleys, makes a very good support.

This plan of operating a pump is sometimes objected to on account of "looks" or "being in the way." At B and C, Fig. 1, is shown an arrangement of triangles and wires under ground. As wire contracts in cold and expands in warm weather, the turn-buckles should be tightened in summer and let out in winter, but should always be kept tight, for if there is any lost motion the triangles will jerk, and not only work unpleasantly, but soon break the wires. The underground plan possesses some advantage on this account, not being so much affected by heat and cold. A careful study of these simple plans will, it is hoped, assist the inexperienced. It is not made a part of this article because it is the best way, but because it is sometimes the only way. The writer does not recommend it very strongly, and would not adopt it when a direct connection to pump could be made by any practical means. The cost of extra material and necessary labor to use triangles would, if spent on an ordinary tower, add very much to its hight, and possibly, if done, place the mill in fair exposure by putting it above the principal obstructions. Two pumps, situated in different wells, one beneath the tower and the other at a distance can both be operated by one mill by the use of triangles. There are pumps operated by compressed air, the air compress being placed in the mill tower and the pneumatic pump placed in the well, which may be any distance away, the compress and pump being connected by small pipe laid below reach of frost. A durable pump operated upon some such principle, that would require but little attention, would doubtless

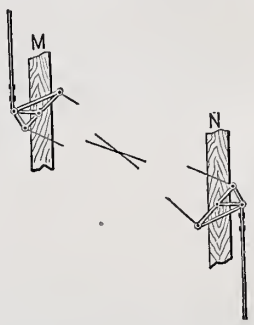



*Fig. 2.—Arrangement for Conveying Power Down a Hill.*

be preferable at the same cost to one operated by triangles. Small geared windmills cost but a few dollars more than pumping mills. By the use of an endless wire belt on grooved pulleys, power may be conveyed to a considerable distance, and pumps operated by a crank-shaft, which would be attended with less friction and liability to derangement than triangles and wires. To a farmer and perhaps many others this plan possesses one decided advantage. The base of the mill tower may be constructed into a mill or workshop, and suitable machiney for grinding feed, cutting fodder, sawing wood, turning, churning, &c., attached, and the usefulness of the windmill increased by affording profitable employment during stormy days.

---

Painted woodwork may be classed among the necessary evils of house decoration. No one in his sober senses will put paint on good woodwork if he can get an equal effect by the use of natural wood. But the costliness of all hardwood, and especially the expense of working it, renders the use of pine practically inevitable.

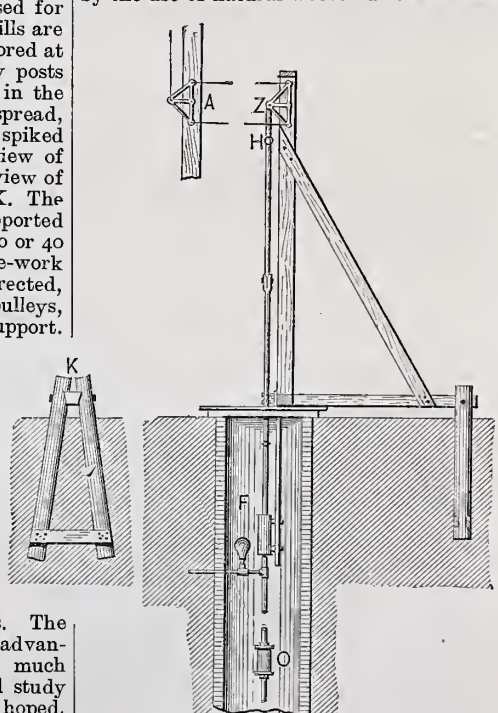



*Fig. 3.—Another Method of Conveying Power from a Mill to a Pump in a Distant Well.*

## Calculating Strains.

We present herewith to our readers some of the solutions of the roof problem, which we have received in compliance with the invitation extended by us in the October number for last year of *Carpentry and Building*. We have selected for publication three solutions, which may be considered typical of the whole number received.

Figs. 1, 2 and 3 show a solution which was received from a correspondent who seems inclined to hide his light under a bushel, by signing himself "Architect." His strain diagrams are correct throughout, showing careful drawing, and the appended table of strains shows close and correct scaling. The following table of strains was appended to this solution :

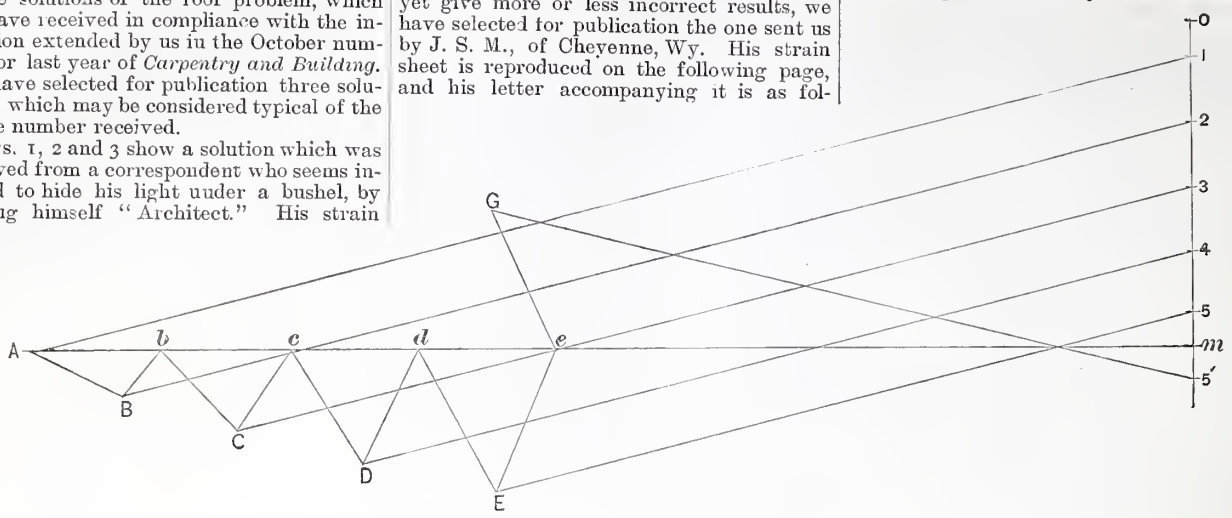



*Fig. 1.—Diagram of Load Strains.*

Strains in roof A F G *g* under steady load and wind action from the left.

Length of span, 100 feet. Hight of roof, 12.5 feet. Length of rafters, 51.4 feet. Maximum load, 50 tons. Normal wind pressure, 13 pounds per square foot. Distance center to center of rafters, 20 feet. Total wind pressure on left side.

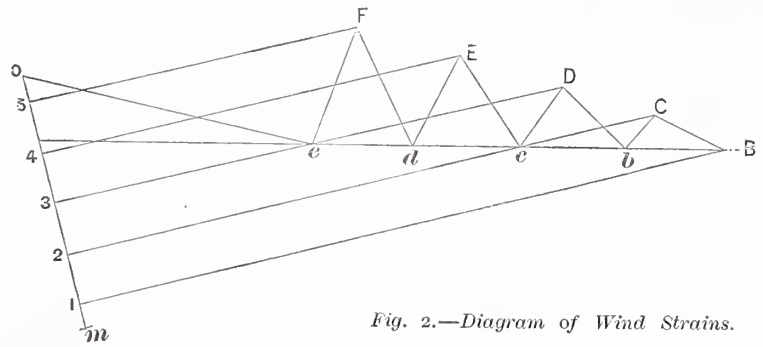



*Fig. 2.—Diagram of Wind Strains.*

TABLE SHOWING STRAINS RESULTING FROM ABOVE CONDITIONS.

| Piece. | Strain. | From Steady load. | From Wind pressure. | Total, in lbs. |
|---|---|---|---|---|
| Tie, A *b* ..... | Tension..... | 180,000 | 37,000 | 217,000 |
| " *b c* ..... | " ..... | 170 000 | 20,000 | 189,000 |
| " *c d*..... | " ..... | 140,000 | 24 000 | 164,000 |
| " *d e*..... .. | " ..... | 120.000 | 18,500 | 138,000 |
| " *e f*..... | " ..... | 100,000 | 13,000 | 113 000 |
| Rafter, A B.... | Compression | 185,500 | 34,000 | 219.5 0 |
| " B C .... | " | 171,800 | 30 900 | 202.700 |
| " C D .... | " | 152,500 | 26,300 | 178.800 |
| " D E.... | " | 132,400 | 21,500 | 153,000 |
| " E F ... | " | 112,000 | 16,500 | 128,500 |
| Struts, B *b*..... | " | 14,900 | 4,100 | 19.000 |
| " C *c*..... | " | 16 0 0 | 4,600 | 21.500 |
| " D *d*..... | " | 20,500 | 5.700 | 26 200 |
| " E *e*..... | " | 24.000 | 6,800 | 30 800 |
| Tie-brace, C *b*.. | Tension..... | 9,500 | 2.600 | 12,100 |
| " D *c*. | " ..... | 14,500 | 4,000 | 18,500 |
| " E *d* . | " ..... | 19,000 | 5,300 | 24,300 |
| " F *e*.. | " ..... | 24,000 | 6,500 | 30,500 |

From among those solutions which, while showing a clear perception of the principles involved in the graphic analyses of trusses, yet give more or less incorrect results, we have selected for publication the one sent us by J. S. M., of Cheyenne, Wy. His strain sheet is reproduced on the following page, and his letter accompanying it is as follows: "Inclosed please find diagram of roof truss, and stress diagrams for steady load and wind pressure in same, as asked for in the October number of *Carpentry and Building*. I have perused with interest the articles on 'Calculating Strains,' and think they contain very valuable information. My strain sheet will show whether I have studied with profit, for I knew nothing of the subject before reading your articles."

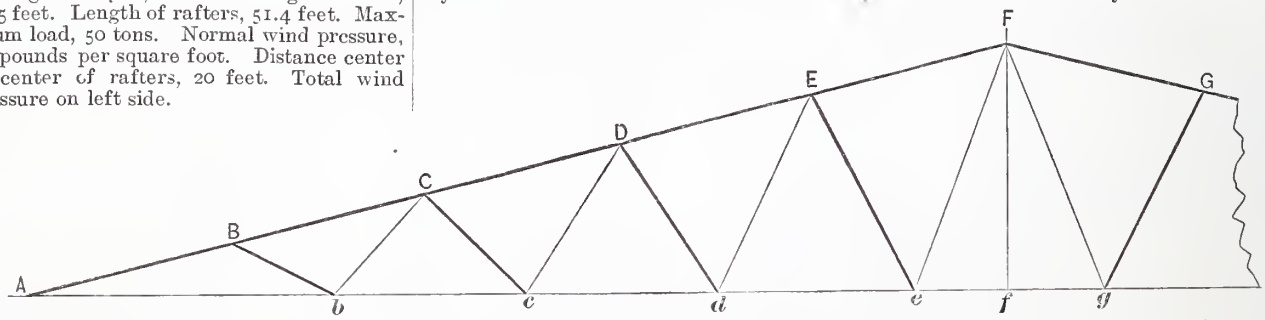



*Fig. 3.—Diagram of Roof Truss.*

SOLUTION OF ROOF PROBLEM, BY "ARCHITECT," NEW YORK.

Mr. J. S. M. has certainly made excellent use of the time bestowed upon reading the articles on "Calculating Strains." His strain sheet shows conclusively that he has mastered the principles of the subject and is working understandingly, and yet the results obtained are incorrect. The cause of this is found in the imperfection of his instruments—drawing-board, T-square and triangle being evidently all three out of true; and furthermore, in the coarseness of his scaling. In other words, while J. S. M. has mastered the theoretical part of the work, he has neglected to bestow that extreme care upon the execution of his drawings upon which the correctness of the result depends fully as much as upon the knowledge of how to make out a strain sheet, and without which the graphic method of strain determination is worthless. The dotted lines in Figs. 5, 6 and 7, Solution No. 2, denote the principal defects in the strain sheet, and however trifling small they may appear, a comparison of his strain table with that of "Architect" shows very clearly to what serious discrepancies these defects have led, and what care is necessary to avoid them.

The third solution is represented in Fig. 4, and constitutes the common error made by many whose stress diagram for steady load was otherwise correctly constructed and carefully scaled, while in constructing the diagram for wind pressure they lost sight of the important fact that the wind pressure, computed at 13 pounds per square foot,

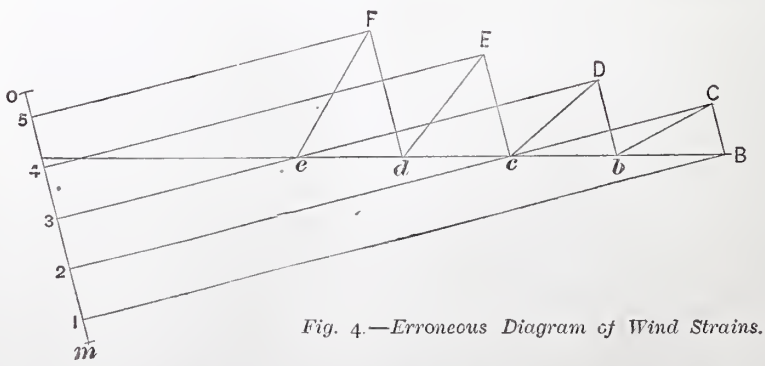



*Fig. 4.—Erroneous Diagram of Wind Strains.*

represented already the normal effect of the wind; that for this very reason the load line was drawn perpendicular to the rafter, and that hence the parallelogram of forces is to be formed of sides parallel to the direction of the braces. The results obtained under such an erroneous construction are evidently so

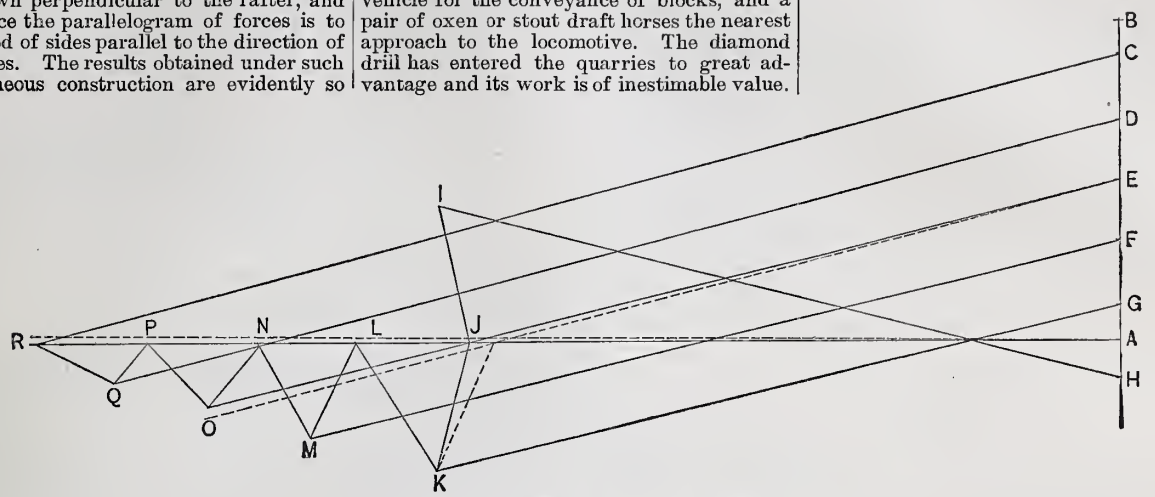



*Fig. 5.—Diagram of Load Strains.*

wide of the mark that we forbear to publish them.

TABLE OF STRAINS ACCOMPANYING SOLUTION NO. 2.

| Piece. | Strain. | From Steady load. | From Wind. pressure. | Total, in lbs. |
|---|---|---|---|---|
| Tie, A R..... | Tension | 181,000 | 35,000 | 216,000 |
| " A P..... | " | 162,000 | 29,300 | 191,300 |
| " A N..... | " | 142,500 | 23,800 | 166,300 |
| " A L..... | " | 123,000 | 18,400 | 141,400 |
| " A J..... | " | 82,500 | 13,000 | 93,500 |
| Rafter, C R..... | " | 186,750 | 34,000 | 220,750 |
| " D Q..... | " | 173,300 | 30,900 | 204,200 |
| " E O..... | " | 154,500 | 26,000 | 180,500 |
| " F M..... | " | 134,500 | 21,200 | 155,700 |
| " G K..... | " | 114,500 | 16,400 | 130,900 |
| Braces, Q R..... | " | 14,400 | 4,300 | 18,700 |
| " P O..... | " | 16,500 | 4,800 | 21,300 |
| " N M..... | " | 20,000 | 5,500 | 25,500 |
| " L K..... | " | 24,500 | 7,000 | 31,500 |
| " Q P..... | " | 9,000 | 3,000 | 12,000 |
| " O N..... | " | 14,500 | 4,250 | 18,750 |
| " M L..... | " | 19,000 | 5,000 | 24,000 |
| " K J..... | " | 24,000 | 6,500 | 30,500 |

Next to raising water, grinding grain, cutting timber and making clothes, the world's greatest work seems to be the fashioning of stones and making of brick. We do not mean to be categorically accurate in our enumeration of the principal trades, but we are near enough for practical purposes. Certainly the stone mason has reason to be classed with the world's great workers. But it is surprising, when visiting the great stone yards and quarries of the country, to find so much exceedingly crude machinery. People in this business seem to be prone to use rough machinery. In the yards the old-fashioned stone-boat is still the principal vehicle for the conveyance of blocks, and a pair of oxen or stout draft horses the nearest approach to the locomotive. The diamond drill has entered the quarries to great advantage and its work is of inestimable value. It bores such holes as no other mechanism can now produce, and it does its special work at an unprecedentedly low rate. Even for short holes it has in many places superseded hand labor. In valuable stones like marble the channeling machine produces an immense saving both by an increased product and also in the quality of the stock. Some of the old methods now abandoned ruined more material than was laid on the bank. These machines, however, are cumbersome. The diamond drill is costly to keep up, and the channeling machine seems to be more complicated than is necessary, yet it has been wonderfully simplified in the last ten years. It is a curious fact that within a half a dozen years it has been asserted under oath that hand channeling could be done at a less price than by machinery, and no little comment has been excited by those who understood quarrying on a large scale at such testimony. In this case, however, as in some others where similar statements in regard to hand labor have been made, there were circumstances which needed consideration before the statement could be decided an error. In a small marble quarry—or, in fact, any small quarry—a large machine requires frequent setting, and, of course, a great deal of time is wasted in preparing to do the work. This makes the work expensive, and the advantage lies altogether with hand labor. The machine, too, labors under the disadvantage of not being able to work into corners and angles, and must do its work in very nearly a vertical position.

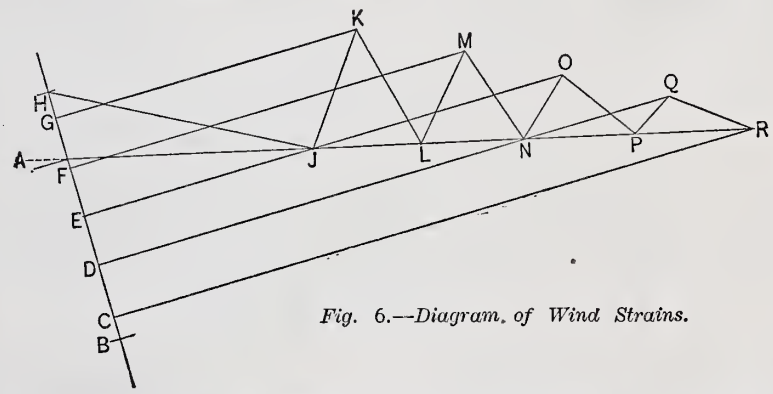



*Fig. 6.—Diagram of Wind Strains.*

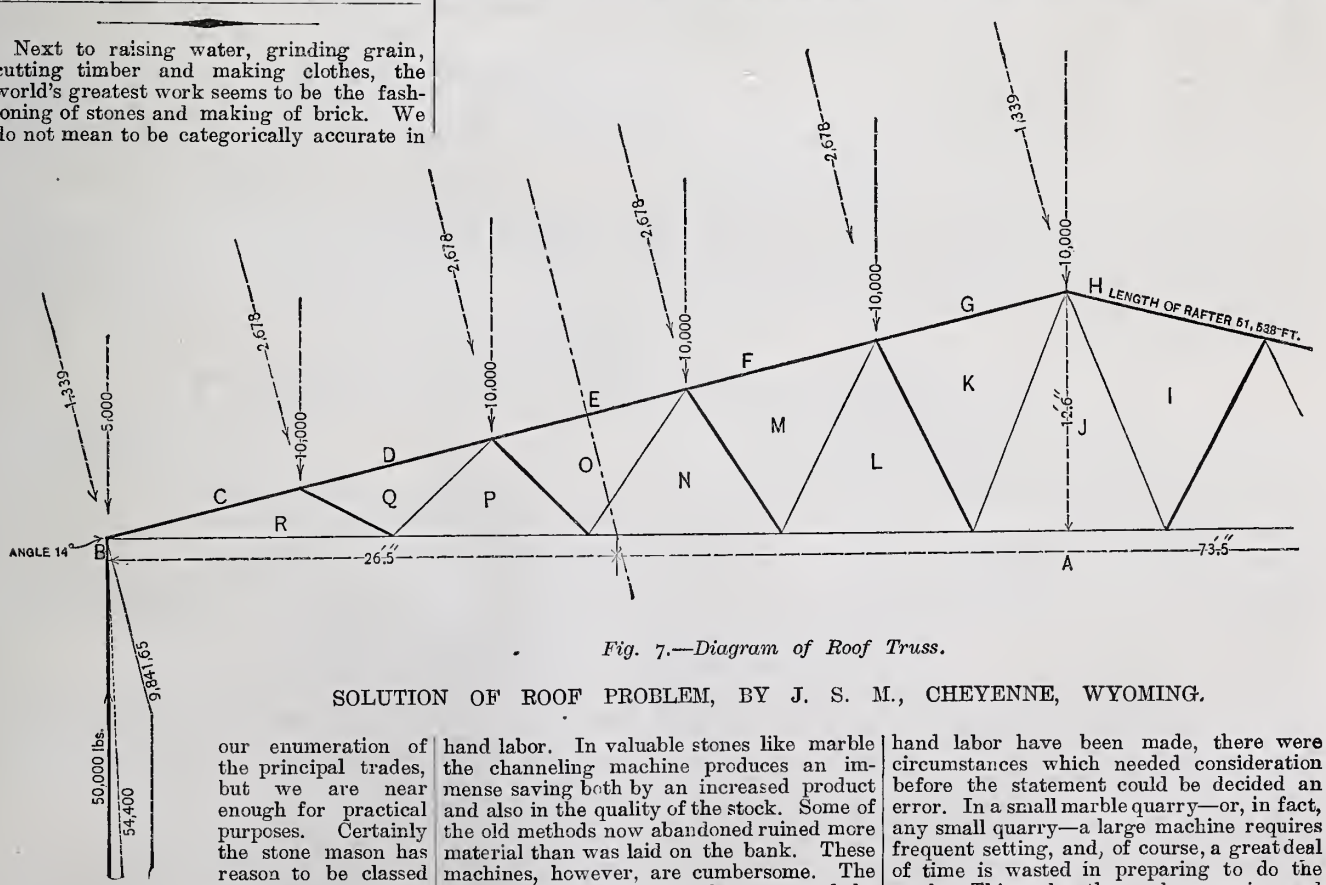



*Fig. 7.—Diagram of Roof Truss.*

## SOLUTION OF ROOF PROBLEM, BY J. S. M., CHEYENNE, WYOMING.

## THE ESTIMATE COMPETITION.

The author of the second prize estimate submitted the following particulars for the consideration of the Committee of Award: "This estimate is intended to include all material and labor necessary to complete the building according to the specification. As the estimate is based on the specification, the items are grouped and succeed each other as nearly as possible in the order in which they are mentioned. I invite attention to my method of carrying out each item of detail in separate columns, as material and labor, and claim that by so doing the chances of error are lessened, in avoiding the tendency to lump off or approximate. This estimate also shows a complete analysis, and can be verified in any part by the figures of sub-contractors for either labor or material, and it affords frequent tests of the correctness of addition by the cross footings."

## Second Prize Estimate.*

BY GEORGE W. PAYNE.

### Masonry.

PRELIMINARIES.

| | Material. | Labor. | Totals. |
|---|---|---|---|
| Building, permit fee, &c. | $2.00 | | |
| Survey of grounds and staking out building | | $15.00 | |
| Privy, care of, and removal | 6.00 | 12.00 | |
| | $8.00 | 27.00 | 35.00 |

EXCAVATION.

| | | | |
|---|---|---|---|
| Sod, soil, and piling same, 245 yds., at 20¢ | | 49.00 | |
| Cellar, footings, pipes, &c., 165 cubic yds., at 18¢ | | 29.70 | |
| Contingent for blasting, pumping, &c. | | 25.00 | |
| Filling around walls, grading, sodding and seeding | | 45.00 | |
| | | $148.70 | 148.70 |

DRAINS.

| | | | |
|---|---|---|---|
| 75 ft. 6-in. sewer pipe, at 16¢ | 12.00 | | |
| 55 ft. 4-in. " at 10¢ | 5.50 | | |
| 16 ft. 3 in. " at 6¢ | 96 | | |
| Traps and connections | 4.50 | | |
| Laying and cementing tile and filling trenches | 2.00 | 10.00 | |
| | $24.96 | 10.00 | 34.96 |

STONEWORK.

| | | | |
|---|---|---|---|
| 24 perches cobble stone, delivered on ground, at $1.25 | 30.00 | | |
| Placing in trenches and ramming, at 50¢. | | 12.00 | |
| 412 cubic ft. footing stone, 10 x 30 in., delivered at 11¢ | 45.32 | | |
| 175 cubic ft. footing stone, 10 x 20 in., delivered at 10¢ | 17.50 | | |
| 100 perches rubble stone for foundation and walls, delivered, at $2.25 | 225.00 | | |
| Laying the above 123½ p., including lime and sand, at $1.25 | 30.85 | 123.50 | |
| 78 lin. ft. window sills and steps, 8 x 9 in., at 40¢ | 31.20 | | |
| 13 lin. ft. coping, 6 x 12 in., at 40¢ | 5.20 | | |
| 25 sq. ft. area platform, and caps for cistern, &c., at 25¢ | 6.25 | | |
| 440 cubic ft. sidewalk plinth, and setting same, at $1.08 | 440.00 | 35.20 | |
| 90 yds. cobble stone and gravel for walks and cellar bottom, at $1.30 | 117.00 | | |
| | $948.32 | 170.70 | 1119.02 |

BRICKWORK, FIREPLACES, ETC.

| | | | |
|---|---|---|---|
| 50 M brick in found'n, chimneys, &c., at $7 | 350.00 | | |
| Lime and sand, and labor laying same | 37.50 | 187.50 | |
| Terra-cotta panels and caps | 24.00 | | |
| Cast-iron gratings, covers, ash-pits, &c. | 27.00 | | |
| Three 8 x 8 ventilating registers | 10.00 | | |
| 50 sq. ft. tile hearths, at $1 | 50.00 | | |
| 6 sets soapstone backs, tops and sides, at $6 | 36.00 | | |
| Facings and borders for 6 fireplaces, approximating | 48.00 | | |
| Cement, and labor setting the above | 10.00 | 25.00 | |
| | $592.50 | 212.50 | 805.00 |

CEMENTING AND PLASTERING.

| | | | |
|---|---|---|---|
| Cement, and labor grouting cellar bottom | 34.00 | 20.00 | |
| 195 yds. cement plastering in cellar and cistern, at 20¢ | 19.50 | 19.50 | |
| 180 yds. lathed plastering on cellar ceiling, at 16¢ | 14.40 | 14.40 | |
| 460 yds. back plasteriug on outside walls, at 18¢ | 36.80 | 46.00 | |
| 1575 yds. finished plastering three-coat work, at 25¢ | 204.75 | 189.00 | |
| Amounts forward | $309.45 | 288.90 | |
| Ornamental plastering, material | 6.00 | | |
| Three centers $3.00; 2 brackets, $4.00. | | 7.00 | |
| 125 lin. ft. 8 x 10 in. cornice, at 25¢ | | 31.25 | |
| 135 " 10 x 12 in. " at 40¢ | | 54.00 | |
| | $315.45 | 381.15 | 696.60 |
| Total cost material and labor, masonry | $1889.23 | 950.05 | 2839.28 |

### Carpentry.

FRAME.

(*Material includes nails where required.*)

| | Material. | Labor. | Totals. |
|---|---|---|---|
| 21,500 ft. dimension lumber, delivered at $18.50 | $397.75 | | |
| To frame and place all timbers, 36 days' work, at $2 | | $72.00 | |
| 840 ft. 6 x 8 locust sleepers, placed at $43. | 33.60 | 2.50 | |
| 3500 lin. ft. 1 x 3 ridging and furring, at $8 | 28.00 | | |
| 5500 lin. ft. 1 x 1 furring for back plastering, at $2 | 11.00 | | |
| Labor cutting aud nailing 9 M. ft. ridging and furring, at $2 | | 18.00 | |
| 14,000 ft. hemlock sheathing, at $19 | 266.00 | | |
| Labor, 140 sq., at 35¢ | | 49.00 | |
| 2000 ft. ½-in. siding, at $23; labor at $10. | 46.00 | 20.00 | |

EXTERIOR FINISH.

| | | | |
|---|---|---|---|
| 800 lbs. sheathiug paper, put on, at 4¢ | $24.00 | $8.00 | |
| 175 lin. ft. outside base, worked out and put on, at 9¢ | 7.00 | 8.75 | |
| 150 lin. ft. lower belt course, worked out and put on at 14¢ | 12.00 | 9.00 | |
| 100 lin. ft. upper belt course, worked out and put on, at 10¢ | 4.50 | 5.50 | |
| 178 lin. ft. eave cornice, worked out and put on, at 35¢ | 28.50 | 38.80 | |
| 90 lin. ft. rake cornice, worked out and put on, at 28¢ | 10.80 | 14.40 | |
| 67 lin. ft. wood cresting, worked out and put on, at 20¢ | 4.70 | 8.70 | |
| 144 lin. ft. corner boards, worked out and put on, at 10¢ | 8.65 | 5.75 | |
| 112 lin. ft. corner beads, worked out and put on, at 6¢ | 2.25 | 4.50 | |

PIAZZAS.

| | | | |
|---|---|---|---|
| 520 sq. ft. piazza and baleony floors, laid, at $5 | $15.60 | $10.40 | |
| 15 piazza posts, turned and carved, at $5.50 | 30.00 | 52.50 | |
| 80 lin. ft. piazza and balcony railing, at 60¢ | 16.00 | 32.00 | |
| Piazza and balcony brackets, approx. | 14.00 | 18.00 | |
| Putting up piazzas and ceiling, same | 15.00 | 30.00 | |

ROOF.

| | | | |
|---|---|---|---|
| 26 M. cedar shingles, at $4.50; laying, $1.50 | 117.00 | 39.00 | |
| 14 M. dimension shingles, at $6.50; laying, $2.50 | 91.00 | 35.00 | |
| Steps and screen-work to piazzas and porch | 10.00 | 20.00 | |
| | $1193.35 | 501.80 | 1695.15 |

WINDOWS COMPLETE, EXCEPT INSIDE FINISH.

(*Material includes sash ready glazed, weights, cord, locks and hinges.*)

| | | | |
|---|---|---|---|
| 6 basement windows without blinds, at $4 | $14.40 | $9.60 | |
| 3 " " with iuside blinds, at $7 | 12.00 | 9.00 | |
| 22 first-story windows, winter sash and blinds, $17 | 264.00 | 120.00 | |
| 22 second-story windows, with blinds, at $14.50 | 220.00 | 99.00 | |
| 13 dormer and gable wiudows, with inside blinds, at $7 | 52.00 | 39.00 | |
| | $562.40 | 276.60 | 839.00 |

DOORS COMPLETE, EXCEPT INSIDE FINISH.

(*Material includes doors ready-made, locks, hinges, bolts, &c.*)

| | | | |
|---|---|---|---|
| Veneered. | 1 pair front doors, with transom glazed | $34.00 | |
| | Material for frame and labor fitting up | 2.50 | $5.00 |
| | 1 pair vestibule doors, panels and transom glazed | 60.00 | |
| | Material for frame and labor fitting up | 1.75 | 4.00 |
| | 1 pair sliding doors, frame, and labor fitting up | 29.50 | 7.50 |
| | Door to parlor, material for frame and labor fitting up | 12.85 | 2.50 |
| | 3 doors 7 ft. 6 in. in hight, frame aud labor, as above | 29.55 | 7.00 |
| | 6 second-story doors, veneered one side only, as above | 47.00 | 13.50 |
| 2 outside doors to back hall, frame and labor | | 22.00 | 6.00 |
| 6 second-story closet doors, material for frames, and labor, &c. | | 50.60 | 10.50 |
| 19 doors, 4 panel, 7 ft. in hight, frames and labor, as above | | 123.50 | 23.75 |
| | | $413.25 | 79.75 493.00 |

* For elevations and details, see *Carpentry and Building* for July, 1882. For specification of materials and labor, see "Star" in October issue, 1882.

FLOORS—INTERIOR FINISH.

| | Material. | Labor. | Totals. |
|---|---|---|---|
| 650 lbs. deafening felt, at 3¢ | $19.50 | | |
| 1250 ft. hard pine flooring, at $35 | 43.75 | | |
| 5000 ft. second-quality flooring, at $30 | 150.00 | | |
| Labor on above, 50 sq., at $1.50 | | $75.00 | |
| | $213.25 | 75.00 | 288.25 |

BASEMENT AND BACK STAIRS.

| | | | |
|---|---|---|---|
| 125 ft. 2 x 12 stringers, cut and placed | $2.30 | 3.00 | |
| 175 ft. hard-pine treads and risers | 7.00 | 6.00 | |
| 200 ft. wainscoting on rake of stairs | 8.00 | 5.00 | |
| 28 lin. ft. cherry rail and supports | 4.00 | 1.50 | |
| | $21.30 | 15.50 | 36.80 |

MAIN AND ATTIC STAIRS.

| | | | |
|---|---|---|---|
| 350 ft. stringers and landing joists, cut and placed | $6.50 | 10.00 | |
| 500 ft. ash finish for treads, risers and landings, at $5 | 25.00 | | |
| Bench work on above 500 ft. ash finish | | 10.00 | |
| Material and bench work for 35 lin. ft. stringers, including 3 cylinders | 3.00 | 7.50 | |
| Do. for 35 lin. ft. straight rail, double | 3.00 | 2.75 | |
| Do. for 8 crooks for above rail | 2.00 | 16.00 | |
| Do. for newel post and brackets | 4.00 | 30.00 | |
| Do. for 35 each of long and short ballusters | 1.40 | 7.00 | |
| Do. for arch beam at foot of stairway | 4.00 | 5.00 | |
| Labor for putting up and finishing above work | | 30.00 | |
| | $48.90 | 118.25 | 167.15 |

DINING-ROOM.

| | | | |
|---|---|---|---|
| Paneled dado of ash, 105 sq. ft., with base and cap | $13.00 | 21.00 | |
| Architraves of ash, 115 lin. ft | 4.00 | 11.50 | |
| Mantel of ash, including mirror | 9.50 | 12.00 | |
| | $26.50 | 44.50 | 71.00 |

LIBRARY.

| | | | |
|---|---|---|---|
| Architraves of ash, 144 lin. ft | $5.00 | 14.40 | |
| Base of ash, 52 lin. ft | 2.60 | 4.40 | |
| Mantel of ash, including mirrors | 10.00 | 18.00 | |
| | $17.60 | 36.80 | 54.40 |

PARLOR.

| | | | |
|---|---|---|---|
| Architraves of ash, 85 lin. ft | $3.00 | 8.50 | |
| Base of ash, 60 lin. ft | 2.25 | 5.10 | |
| Mantel of ash, including mirrors | 12.25 | 20.00 | |
| | $18.50 | 33.60 | 52.10 |

HALL AND VESTIBULE.

| | | | |
|---|---|---|---|
| Architraves of ash, 131 lin. ft | $4 60 | 13.10 | |
| Wainscoting of ash, 205 sq. ft., base and cap | 19.75 | 21.00 | |
| Panel-work of ash at foot of stairs | 2 00 | 6.00 | |
| | $26.35 | 40.10 | 66.45 |

KITCHEN, PANTRIES AND TOILET-ROOM.

| | | | |
|---|---|---|---|
| Architraves of pine, 314 lin. ft | $6.30 | 12.60 | |
| Wainscoting of pine, 126 sq. ft | 6.25 | 5.00 | |
| China and preserve closet | 12.00 | 24.00 | |
| Pantry and pot closet | 6.80 | 15.00 | |
| Toilet-room woodwork | 3.00 | 8.00 | |
| | $34.35 | 64.60 | 98.95 |

THREE PRINCIPLE CHAMBERS ABOVE.

| | | | |
|---|---|---|---|
| Architraves of pine, 384 lin. ft | $11.50 | 19.20 | |
| Base of pine, 153 lin ft | 4.60 | 9.20 | |
| Closets and wash-stands, woodwork | 5.00 | 21.00 | |
| 3 mantels of pine, including mirrors | 20.00 | 40.00 | |
| | $41.10 | 89.40 | 130.50 |

HALL AND ALCOVE, SECOND STORY.

| | | | |
|---|---|---|---|
| Architraves of ash, 153 lin. ft | $5.40 | 12.40 | |
| Base of ash, 46 lin. ft | 2.00 | 3.75 | |
| | $7.40 | 16.15 | 23.55 |

BATH-ROOM.

| | | | |
|---|---|---|---|
| Architraves of ash, 48 lin. ft | $1.70 | 3.75 | |
| Wainscoting of ash, 96 sq. ft | 5.00 | 6.75 | |
| Panelwork of ash, bath-tub and closet | 2.00 | 4.00 | |
| Tank of ash | 1.00 | 3.00 | |
| | $9.70 | 17.50 | 27.20 |

LAUNDRY, REAR CHAMBERS AND ATTIC.

| | | | |
|---|---|---|---|
| Architraves of pine, 438 lin. ft | $8.75 | 17.50 | |
| Base " 150 " | 4.50 | 7.50 | |
| Wainscoting " 75 sq. ft. (laundry) | 3.00 | 2.50 | |
| Tub frame, tables, rollers and supply tank | 11.00 | 15.00 | |
| | $27.25 | 42.50 | 69.75 |

MISCELLANEOUS.

| | Material. | Labor. | Total. |
|---|---|---|---|
| Bins and shelves in vegetable cellar | $6.00 | 4 00 | |
| Coal bins, shute, &c | 8.00 | 6.00 | |
| 4 mantel shelves | 1.50 | 7.50 | |
| Work after plumber | 2.00 | 6.00 | |
| Cleaning, scrubbing, &c | | 8.00 | |
| 325 ft. picket fence, at 30¢ per ft | 58.50 | 39 00 | |
| 12 clothes-line posts | 3.00 | 1.50 | |
| Swill locker | 7.20 | 5.00 | |
| | $86.20 | 77.00 | 163.20 |
| Total cost material and labor, carpentry | $2747.40 | 1529.05 | 4276.45 |

**Ornamental Ironwork.**

| | | | |
|---|---|---|---|
| 9 window guards, basement, 350 lbs | $14 00 | 18.00 | |
| Grille over front transom | 3.00 | 12.00 | |
| 7 finials, wrought | 1.50 | 7.00 | |
| Sun-dial, cast-iron | 8.00 | | |
| | $26.50 | 37.00 | 63.50 |

**Bells and Tubes—Gas Pipes.**

| | | | |
|---|---|---|---|
| 6 bells, complete | $18.00 | 12.00 | |
| 5 speaking tubes, complete | 5 06 | 10.00 | |
| Gas-piping, 24 burners | 25.00 | 60.00 | |
| | $48.00 | 82.00 | 130.00 |

**Furnace.**

| | | | |
|---|---|---|---|
| Furnace, set up | $250.00 | 10.00 | |
| Cold-air box, 110 lbs. galvanized iron | 8.80 | 6.00 | |
| Hot-air pipes, tin | 12.00 | 28.00 | |
| Registers and soapstone borders, set | 58.00 | 5.00 | |
| | $328.80 | 49.00 | 377.80 |

**Plumbing.**

| | | | |
|---|---|---|---|
| Iron force-pump, brass cylinder | $12.00 | | |
| 2400 lbs. iron pipe, at 4¢ | 96.00 | | |
| 100 lbs. copper for lining tanks, &c., at 32¢ | 32.00 | | |
| 1625 lbs. lead pipe, traps, trays, &c., at 7½¢ | 121.90 | | |
| 50 lbs solder for joints, &c | 7.50 | | |
| Soapstone washtubs, and sink and cocks | 37.50 | | |
| Copper range boiler | 32.00 | | |
| Water-closet in toilet-room | 12.00 | | |
| 4 wash-bowls and cocks, complete | 60.00 | | |
| Water-closet in bath-room | 15.00 | | |
| Bath-tubs and cocks | 20.00 | | |
| Plumbers' work to complete | | 100.00 | |
| | $445.90 | 100.00 | 545.90 |

**Tinwork.**

| | | | |
|---|---|---|---|
| 150 lin. ft. 14-inch gutter, at 12½¢ | $6.00 | 12.75 | |
| 56 lin. ft. 4-inch galv. iron down-pipe | 4.00 | 7.20 | |
| 100 lbs. zinc flashings | 8.00 | 10.00 | |
| 4 lead goose-necks | 5.00 | | |
| | $23.00 | 29.95 | 52.95 |

**Painting.**

OUTSIDE WORK.

| | | | |
|---|---|---|---|
| 200 yds. two-coat work, 4 colors, at 16¢ | $14.40 | 17.60 | |
| 425 yds. on roof, Venetian red and oil, 2 coats, at 12¢ | 25.50 | 25.50 | |
| 44 pairs blinds, 3 coats green, at $1 | 18.00 | 26.00 | |
| 105 yds. (piazza floors, &c ), 2 coats oil, at 10½¢ | 5.00 | 6.00 | |
| 70 yds. brickwork, 1 coat oil, at 8¢ | 3.10 | 2.50 | |
| 325 ft. fence, 2 coats lead and oil, at 12½¢ per foot | 16.00 | 24.60 | |
| | $82.00 | 102.20 | 184.20 |

INSIDE WORK.

| | | | |
|---|---|---|---|
| 310 yds. hardwood finish, 5 coats, at 50¢ | $62.00 | 93.00 | |
| 100 yds. pine finish, 4 coats, at 36¢ | 12.00 | 24.00 | |
| 95 yds. pine finish, 3 coats, at 30¢ | 9.50 | 19.00 | |
| 50 yds. shellac and varnish, 2 coats, at 20¢ | 6.00 | 4.00 | |
| 115 yds. distemper work, 3 colors, at 12¢ | 3.45 | 10.35 | |
| Dado rail and picture mold, put up | 20.00 | 7.50 | |
| | $112.95 | 157.85 | 270.80 |
| Total cost material and labor, painting | $194.95 | 260.05 | 455.00 |

**Recapitulation.**

| | | | |
|---|---|---|---|
| Masonry | $1889.23 | 950.05 | 2839.28 |
| Carpentry | 2747.40 | 1529.05 | 4276.45 |
| Ornamental ironwork | 26.50 | 37.00 | 63.50 |
| Bells, tubes and gas-pipes | 48.00 | 82.00 | 130.00 |
| Furnace | 328.80 | 49.00 | 377.80 |
| Plumbing | 445.90 | 100.00 | 545.90 |
| Tinwork | 23.00 | 29.95 | 52.95 |
| Painting | 194.95 | 260.05 | 455.00 |
| Total cost material and labor | $5703.78 | 3037.10 | 8740.88 |

**Incidentals.**

| | |
|---|---|
| Heating building during progress of work | 75.00 |
| Insurance | 100.00 |
| Care of public highway, in compliance with law | 25.00 |
| Total cost of building (profit to be added) | $8940.88 |

## CORRESPONDENCE.

### Shingling Valleys.

*From* F. B., *South Essex, Conn.*—In the June number of *Carpentry and Building* I find an inquiry from G. F. B. for a method of shingling valleys in a roof of half pitch without using valley tin. I have not used metal in shingling valleys for 12 years past. I take a strip of board the length of the valley, 2½ inches wide and ⅞ inch thick, and beveled so as to fit the angle of the valley and nail it in place. I then select shingles 3 inches wide, and, commencing in the valley, lay the first course double and extending out on each side of the roof a foot or more, or until the shingles run parallel with the roof. The first shingles from the valley must be beveled on the edge next to the valley to make a neat job. This plan is the reverse of shingling a hip as described in the January issue of *Carpentry and Building* for 1881.

### Parlor Elevator.

*From* A. J. W.—Will you please inform me, through *Carpentry and Building*, where I can obtain the parlor elevator, an illustrated notice of which was published in an issue of *Carpentry and Building* some two or three years ago.

*Note.*—We regret that we are unable to give the correspondent the information that he requires. We have had several other inquiries of a similar character addressed to us recently. According to the information which has reached us, the business in question was removed some time since to Chicago—if we are not mistaken, passing out of the hands of the parties who were operating it at the time our notice was inserted. If the elevator in question is being manufactured in Chicago or elsewhere, and any of our readers will give us the information, they will confer a favor.

### Purifying Cisterns.

*From* O. T. B., *Rochester, Ill.*—I would recommend to those who are troubled with cisterns that smell bad the following directions: Plunge a pail to the bottom, thoroughly stirring up the water. Repeat this several times each day for a week. Order a strainer from the tinshop, constructed something as follows: The top is to be like a slanting table, and to be covered with fine strainer cloth—in size, say 4 x 6 inches. The tray to which this strainer is soldered is to be about 2 inches deep, leaving a space of, say, 2 inches between the lower end of the conductor pipe and the strainer. The object of this arrangement is to prevent bugs and vermin from entering the cistern. If such fall through the spout, they can escape by means of the wire cloth, without being carried into the cistern. If the strainer is made smaller than 4 x 6 inches, it will be liable to be clogged with spider webs and the like in a short time. Made large enough for the purpose, it will answer satisfactorily.

### Secretary and Bookcase.

*From* F. H. S., *Gardner, N. Y.*—In reply to G. H., of Marysville, Mo., I send a sketch of a bookcase and secretary that I have made for myself, and which, from experience, I consider a good one. The article is made of black walnut and ash, full paneled, the panels being of ash. The inside work is of white wood. In hight it stands 7 feet. The desk is sloping. The writing-lid is hinged at the bottom, and rests on a pair of brass supports, one being shown at A in the side view. Below the writing desk is a drawer, and under it are shelves and pigeon-holes. The vertical section shows how the desk is constructed, and the adjustability that is provided for the shelves. The crown molding surmounting the bookcase is made of ash and walnut. As I have it constructed, the top of the bookcase is left open, but, as it proves somewhat of a dust catcher, I propose to hang a panel door, hinged at the top, so as to open upward.

*Fig. 1.—Front Elevation.*

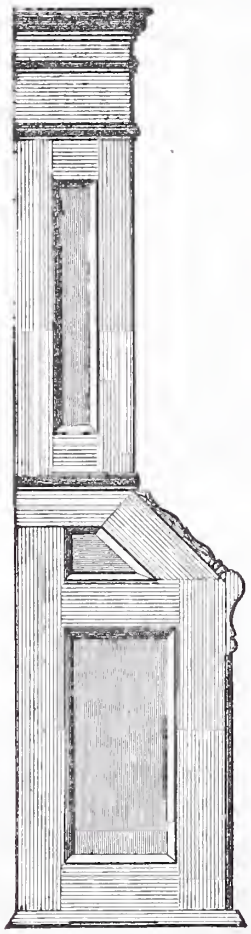


*Fig. 2.—Side Elevation.*

*Design for Secretary and Bookcase, Submitted by F. H. S.*

### Tin Houses.

*From* X. X., *Pennsylvania.*—Why should not tinners have tin houses? Why not hire a good common-sense carpenter to frame the house balloon style, placing the scantling from center to center at such distances that strips of roofing tin would work against them? Let the rafters be placed the same distance apart and in a line with the scantling inside of the house. Then have strips long enough made of tin without seams, or, if from single sheets, seamed and soldered. Put the strips on the sides and over the roof, working them standing-seam style. Double seam the strips where they meet at the ridge of the roof. Finish the ends of the house with similar tin strips. Use no board siding unless there is money enough to warrant doing so. Have the walls inside made of strips of No. 28 common sheet iron seamed or tacked on to scantling. Finish the ceiling in the same way. Paint or kalsomine in the inside, or paper, or live without anything but the sheet-iron finish until you are able to finish as you desire. Further, if your pocket will not warrant it, you may for a time dispense with all covering in the inside of the house; in place of mud mortar, prepared paper may be used for walls and ceiling. The result will be a house cheap, wind-proof, water-tight and vermin-impregnable. Then, with 9-inch galvanized-iron pipe for chimneys, nothing will be lacking for the tinman in a tin and sheet-iron house appropriate to his trade, and durable as well as comfortable.

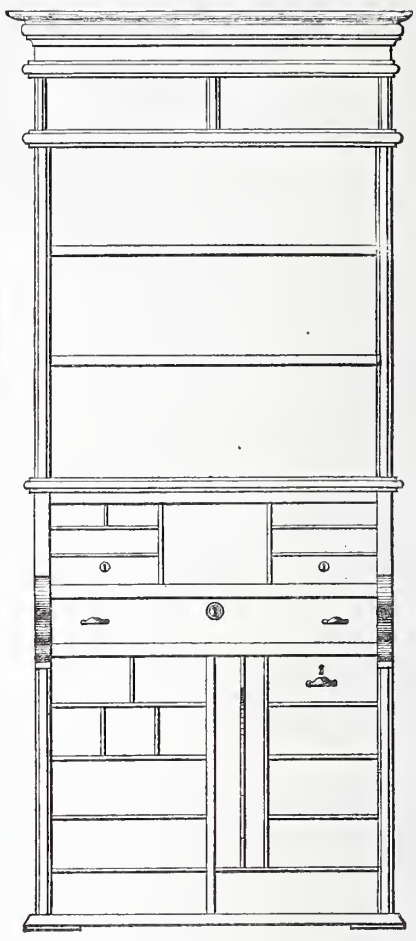


*Fig. 3.—Front View, with Doors Removed.*

*Note*—Our correspondent's idea is a very pretty one, but we fear it is far from practical when questions of construction are taken into account or relative cost. While there is no difficulty in making a building as he describes it wind and water proof, we fear that a very little figuring will show that actual economy is not on the side of the employment of metal, while the advantages of a house of the kind he mentions would not warrant its existence alongside of those of more ordinary features of construction. Thin sheet iron or tin plate, supported simply at the edges or seamed upon scantling, as above described, is a very poor substitute for the solid walls which a building ought to possess. It takes but very slight usage to wear out such a house, especially in those portions near the ground. Without entering into extended arguments upon this point, we have only to refer him to sheet-iron roofs or the sides of warehouses finished in sheet iron, plain

or corrugated, for illustration of our meaning. In these structures, heavier metal by far is employed than he would advise in the house mentioned. Therefore the danger

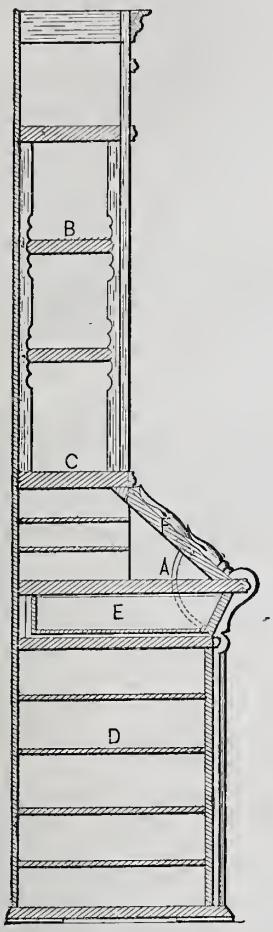



*Fig. 4.—Vertical Cross-Section.*

of holes and rust spots must be greater in the latter case than in the former.

The fling at mud mortar in which our correspondent indulges seems to us to be unwarranted by the facts of the case. Mortar, as applied in the plastering of a house, is cheaper material than that which our correspondent would substitute. After it is finished—considering the properties of the two materials with reference to radiation of heat—we think the "mud mortar," so called, is preferable.

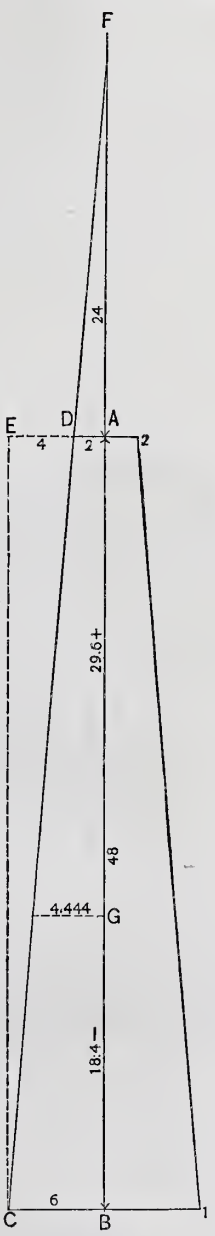
The idea of a mechanic building a house for himself is always an attractive one, and

*Fig. 5.—Section Through Crown Molding.*

where he is working in materials adapted to building construction it is a worthy ambition for him to possess. It is a mistake, however, for every mechanic to think that he should build his own home, adapting the materials of his trade to the construction of the house. It is far better for him to earn money at his trade, that being the line in which his skill and acquirements bring him the greatest income, and, in turn, expend the same upon those men who are best able to give him what he wants in the way of a home. In other words, it were better, in the case above cited, for the tinner to earn money in laying tin roofs and expend the same in paying for mortar for his plastered walls than to attempt to cover his walls with tin or sheet iron.

### Center of Gravity of Solids.

*From* JOHN C. RANKIN, *Mount Vernon.* N. Y.—Your correspondent W. B. H. requests to learn a method of finding center of gravity




*Center of Gravity of Solids, Contributed by John C. Rankin, Mount Vernon.*

of solids—for instance, of a board 24 feet long, ends 12 and 4 inches wide, respectively, and regular taper. The following is one way in which it can be done: To keep the diagram within reasonable bounds we will call it only 48 inches long, and assume it to be of uniform density and thickness. Obviously, the center of gravity of surface, so to speak, will be at the middle of a straight line drawn across the board, parallel with the ends, which shall divide it into two parts of equal surface, and the center of gravity sought will be at the middle of the thickness at a point perpendicular to face of board and the central point of its surface. Now, to find the dividing line: Let 1 2 E C represent the board 48 feet long, ends 12 and 4 inches. Extend central line A B and side line C D till they meet at F; extend 2 D indefinitely; from C draw C E parallel with A B. Next find the following: The length of B F (72) thus—D E : C E : : B C : B F; ½ area of A B C D (96), area of B C F (216) and area of A D F (24); then, say: Area B C F (216) : B C (6) : :

$$\sqrt{\text{ar. B C F} \times (\tfrac{1}{2}\text{ ar. A B C D} + \text{ar. A D F})} \text{ (160) : dividing line (4.444 +).}$$

$$\text{Now } \frac{\tfrac{1}{2}\text{ ar. A B C D}}{\text{Div. line } 4.444 +} = \text{B G} = 18.4 - .$$

The point G is center of surface.

I do not offer the foregoing as the readiest road to the solution, for I have had occasion to study it before, and reached my destination by a shorter cut (which I cannot now recall), but because it was one way to reach the point, and involves considerable reasoning and a number of very pretty little problems and suggestions, the investigation of which would be a good exercise for the young student.

### Size of Water Pipe.

*From* W. A. H., *Warwick.*—I have a question to ask in the columns of *Carpentry and Building.* A wants to put a fire hydrant in his yard, which is 1208 feet from the street; it has a 4-inch pipe. A puts in 604 feet and B puts in 604 feet of the pipe. Now, B will only put in 3-inch pipe, and if A puts in 4-inch pipe, will there be a greater pressure from the water than if it was all 3-inch pipe, or is there no difference?

*Answer.*—The reduction in the size of the pipe will make a very material difference in the flow of water. The area of the pipe is a very fair measure of the amount of friction there will be in proportion to the quantity of water. In the 3-inch pipe the area is only 7 inches; in the 4-inch pipe it is 12½ inches. The circumference of the bore of the pipe is 9½ to 7 in the smaller size, and in the larger it is 1 to 1. One of the things which it is very difficult to make people understand is the enormous difference in the amount of water which will flow through pipes differing but slightly in size. Not one man in 100 is ready to believe that a 2¼-inch pipe is more than three times as large as 1¼ inch, nor that a 4-inch pipe is about 15 times larger in its area than a 1-inch. It is a very good rule, when we want to compare pipes with each other and have no tables to use, to multiply the diameter of the bore by itself, thus: 1 times 1, of course, is 1; 4 times 4 is 16. The areas of the two pipes compare, then, something like the ratio of 1 to 16. If a 2-inch pipe, the diameter multiplied by itself gives 4, and a 4-inch pipe will give 16. This is sufficiently exact for questions which come up and must be answered off-hand.

## REFERRED TO OUR READERS.

### Tar for Painting Metal Roofs.

*From* P., *Mechanicsburg, Ohio.*—Many inquiries have been made through *Carpentry and Building* for information regarding the use of tar for painting metal and wood roofs. The following will undoubtedly be found of interest, as the paint named is well adapted for use on either metal or shingles: Take mineral or vegetable tar and add one bushel of fresh slaked lime to one barrel of tar. Boil well and apply to the roof hot. This is easily done, and the paint can be put on thin while hot. The lime neutralizes the acid; accordingly, a pint prepared in this manner will preserve and not corrode the metal. I know but little as to when and how lime neutralizes the acid in the tar; that it does it, however, I am fully convinced. When thus prepared it has acted with perfect success, so far as I have tried it. Being applied hot it spreads rapidly, and well mixed there is no running in the heat of the sun. On wood shingles it acts admirably, making them impervious to rain, and to a certain extent fire-proof; it makes the fiber lie close, it permeates the grain, and in a few days becomes hard, making the surface something like a brick. From where I am writing at this time I can see the good effects of this material as a paint. A mill roof was partly coated with the mixture three years ago; that portion of the roof is in good preservation, while the uncoated part is thickly covered with moss. I understand that John R. Roebling's Sons use this paint extensively,

and recommend it for submerged and underground steel and iron cables.

*Note.*—We shall be pleased to hear from our readers who have experimented with a paint composed as above. We desire the record of practical results rather than theories.

### Design for Sideboard.

*From* H. J. C., *Akron, Ohio.*—Will some of the readers of *Carpentry and Building* please furnish for publication an elevation and detail for a sideboard suitable for construction by those doing cabinet finish in house construction? It should be adapted for use in a residence of moderate cost. For my present needs I want one constructed of cherry, natural wood finish.

## TRADE PUBLICATIONS.

### Fish Glue.

The Russia Cement Co., of Gloucester, Mass., have issued a very neat oblong pamphlet, pocket size, descriptive of the manufacture and uses of fish glue. The first subject treated in the pamphlet is the state of the art previous to 1876, wherein the advantages of fish glue and isinglass, as it is commonly called, are succinctly stated. Following this is a description of the new method pursued by the Russia Cement Co., which has made the trade a practical success. The reader is then presented with a list of the special uses to which the Le Page glues, made by this company, are adapted, among which are mentioned their employment in boot and shoe manufacture, for sizing textile fabrics, for the manufacture of oilcloths, for gummed paper and envelopes, for family and office use, for woodwork and for carriage work. These pamphlets are sent to any address, on application, and contain many facts that are of interest to all who use glue. A number of testimonials conclude the pamphlet.

### Structural Decoration.

The above is the title of a little pamphlet issued by the H. W. Johns Mfg. Company, of 87 Maiden Lane, New York, and devoted to illustrations of the methods of using paints manufactured by that company. How to paint a house so as to make it attractive rather than an eyesore is one of the questions which almost every builder is called upon to solve, and the solution is especially difficult to one outside of the larger towns who has to be his own painter, or at least has to superintend the laying on of the paint and the purchase of materials. This little pamphlet contains a good deal of practical information not only about paints, but about the best way of applying them, and the shades which may go together in order to produce a harmonious effect. Example is notoriously more satisfactory than precept, and in this case the example is provided in the form of colored panels surrounded by darker or lighter orders, as the case may be, and illustrating many of the most popular styles of decorating in one, two or three colors. The first one of these consists of two panels surrounded by strips of different colors, which harmonize or contrast with them, and which can be satisfactorily used for trimmings; for example, an olive-green is shown with an old gold, a terra-cotta and a deep or Pompeiian-red trimming and a yellow-ocher—or, as it is at present called, a Tuscan-yellow—panel as a similar choice of trimming colors. Again, we have panels shown of buff, with different shades of stone-yellow for trimmings. A similar scheme of trimming, but with drab colors, is shown on another page, while the third example gives the effect of trimming with colors lighter than the panels. These plates, in five minutes, do more to educate the eye and the understanding in regard to what colors can be used to produce effective contrasts or harmonies than the longest dissertation on colors that ever was written. People may make endless suggestions in regard to shades, but until the eye has had some education it will be like talking of sound to a deaf man. The colors made by this company are, as many of our readers know, exceedingly satisfactory, and dry, with a bright and glossy surface. The instructions in regard to house painting are really worth attention, and, though short, are to the point, and deserve to be kept in mind when painting is to be done.

### The Durham House Drainage Co.

We have received from the Durham House Drainage Co., New York, a list of the fittings used in the Durham system of house drainage. As a list, it is one of the most complete which we have ever seen, and embraces almost everything in the line which could well be imagined. In the wrought-iron fittings the sizes run 2, 3, 4, 5 and 6 inch. No less than 143 pieces are enumerated, and the list is so arranged that ordering by numbers is perfectly simple. The first part of the list is arranged numerically, and the last part is arranged according to the different classes, sizes and styles. The company, as many of our readers are no doubt aware, are not attempting to compete in price for work. The aim is to give the public the assurance of the best possible engineering skill, and when they put in a piece of work to leave the householder with the feeling that, so far as skill and careful attention can go, the work is beyond all cavil. The idea which is the fundamental one of the company certainly recommends it strongly to those who have had experience in the attempt to get first-class work from irresponsible parties. One of the crying evils of the day, where people are putting in plumbing work and wish to have it perfectly safe, is the fact that they have to pay first-class prices and get work which is only little better than that of the old-fashioned scamping. It is satisfactory, therefore, to know that one can, when desirous, get first-class work by paying for it. With fittings of the kind this company are using, we think it is perfectly possible to do what we have often spoken of in these columns as desirable—namely, to put the whole waste system of a house under a pressure test like that applied to gas or water pipes, and in this way demonstrate whether the joints are perfect or not and whether the work has been done in a satisfactory manner.

### Wood-Working Machinery.

Messrs. C. B. Rogers & Co., with office and factory at Norwich, Conn., and warehouse at 109 Liberty street, New York, have sent us a copy of their illustrated catalogue of wood-working machinery. The pamphlet contains 196 pages of text and illustrations, and is a complete exposition of the various tools and machines manufactured by this concern. In the introductory preface the statement is made that the times demand and manufacturers require much more effective machinery than formerly to produce the quality and quantity of work needed; accordingly, it has been the aim of this firm, in the construction of its new machines and the improvements of old ones, to meet all the requirements of such machinery. The list presented is a large one, and embraces tools of nearly every description and adapted to all classes of business. Mention is made of the numerous testimonials of superiority of the machinery of this firm at some of the great competitive exhibits of the world. Gold, silver and bronze medals were awarded to Messrs. C. B. Rogers & Co. at the World's Fair in London, 1851; Crystal Palace Exhibition, New York, 1854; Paris Exposition, 1867; Vienna Exposition, 1873; Chili Exhibition, 1875; Centennial Exhibition, 1876; Paris Exposition, 1878; Sydney, N. S. W., 1879. and at many local exhibitions. It would be impossible in a brief notice to mention the tools and machines that are described in this work. The illustrations and letter-press are excellent in quality, and every one who is contemplating fitting up a shop will do well to procure a copy of the work.

## STRAY CHIPS.

The E. T. Barnum Iron and Wire Works, of Detroit, Mich., have recently opened a branch establishment in Windsor, Ont., the object of which has been to regain a certain amount of the Canadian trade that has been diverted from the parent establishment by changes in laws affecting the exportation of goods. The branch concern is under the management of Mr. H. W. Booth, well known in Canada from his connection with various hardware and manufacturing concerns. A branch has also been established in Chicago for the better distribution of the productions of the concern. Fire escapes are one of the most recent additions to the line of goods made by this company. Some very desirable features are incorporated in them by which any number can descend at once, while there is a minimum of danger from crowding or falling.

Mr. Frank Gilbert, of Mansfield, Ohio, is putting up a frame house on the corner of Marian avenue and West Market street, in that city, that is to cost $12,000. Mr. C. H. Merrick, of Syracuse, N. Y., is the architect.

The Government Building at Peoria, Ill., work upon which has just commenced, is to be 69 x 120 in plan and two stories and an attic in hight. Quarry-faced stone with cut-stone trimmings will be used in its construction. It will have a high-pitched roof, stone dormers and angle turrets. The style of architecture will be Gothic, with some modifications approaching the Renaissance. The main floor of the structure will be used for the post office, and the second floor for court rooms and judicial offices. The estimated cost, including the site, is $225,000.

The Minnesota State Prison, at Stillwater, Minn., is to be enlarged by an extension, to cost nearly $50,000.

The directors of the Linoleusta-Walton Mfg. Co. have issued a circular under date of August 1, in which they announce to the public generally that Messrs. Fr. Beck & Co., of 41 Union Square, New York, have been appointed sole agents in the United States for the sale of their new decorative material.

We have received from Mr. C. M. Bartberger, architect, of Pittsburgh, Pa., the perspective view of a house recently erected to designs furnished by him for Mr. A. E. Luccops. The perspective shows a house of brick with mansard roof, central tower in front veranda, with light posts, and two bay-window projections on the principal side elevation. From his description, we learn that the brick walls are faced with selected brick of uniform cherry-red color, laid in pressed-brick style. The interior is finished in a manner corresponding to the elegance of the outward appearance. Carved walnut mantels are employed, and the vestibules are laid with encaustic tile. The cost of the building was $20,000.

Mr. E. Bassford, architect, of St. Paul, Minn., has prepared the plans for a hotel building to be erected at Hastings, to cost, when completed, $20,000. He has also furnished the plans for four dwellings for Mr. Bradshaw to cost $8000, and also for a double house for the same party to cost $5500.

Mr. Frederick B. White, architect, of New York City, has prepared the plans for an exceedingly handsome and unique school-house and entertainment hall, to be erected at Manasquan, N. J. The structure will be 82 x 96 feet in size, constructed of brick and terra-cotta. Mr. White was also the architect for a very pretty club house that was completed at Princeton, N. J., a short time since.

Reports from Steubenville, Ohio, indicate that there is considerable activity in the building line at present. Two new school-houses are to be erected at a cost of $12,500 each. The new city opera and market house, commenced some time since, and which is estimated to cost $65,000, is nearly completed.

The residence of Senator Sherman, on West Market street, Mansfield, Ohio, is about to be enlarged, remodeled and improved. The additions will consist of a library on the northeast corner, three stories in hight; converting the kitchen into a dining-room, two stories in hight, and the erection of a kitchen on the northwest corner, two stories high. A tower will also be constructed over the front entrance. The ceiling of the library, dining-room and hall will be paneled in hardwood. Mr. M. Ruinbaugh, of Mansfield, prepared the plans for the improvements, which are estimated to cost from $8000 to $10,000. Capt. J. L. Skeggs has the contract for the woodwork.

Mr. T. F. Schneider, of Washington, D. C., is preparing the plans for a church building, to be erected at Riverton, Va. He also furnished the plans for the two-story dwelling that is being put up by Mr. Samuel Carson, at Riverton, Va. The structure is 42 x 50 feet in size, constructed of brick, with slate roof and wide veranda. The cost is put at $40,000.

The contract for the Porter County Court House, at Valparaiso, Ind., has been let. The building is to be 88 x 118 feet in dimensions and two stories in hight. The style of architecture is the Renaissance. The material used in its construction will be Indiana stone, and the cost, when completed, $126,000.

Mr. Albert West, of Richmond, Va., is the architect for a building in progress of construction at Danville, Va., that will be known as "The Danville College for Young Ladies." The cost is estimated at $20,000.

There is a fine opening in St. Louis, says a correspondent, for a good brick machine, and a man who knows how to run it. While the number of brick-making establishments increases yearly, they fail to keep pace with the growth of the building interests. Every year buildings in progress are delayed, and the work interrupted from time to time, because bricks cannot be obtained fast enough. The bricks in a kiln are sold in advance of burning, and purchasers stand ready to take them all as soon as the kiln cools sufficiently to handle them. The quality of the St. Louis machine-made stock brick is so excellent that they find an extensive sale not only in St. Louis and vicinity, but in all parts of the West and Northwest; also in the South and Southwest.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=NOVEMBER, 1883. NUMBER 11

### An Extraordinary Building.

The narrowest house in New York may be seen at the northwest corner of Lexington avenue and Eighty-second street. When Lexington avenue was cut through some years ago, a strip of land 5 feet wide and 100 feet deep was all that was left of a certain lot belonging to a person who did not own the next lot on the street. The strip, while of little value by itself, would be valuable to the person owing the adjoining lot on Eighty-second street, because it would not only enable him to build a house 5 feet wider, but would give him windows all along the side of his house on Lexington avenue. The two owners, however, could not agree as to terms, and a house was erected on the lot adjoining the narrow strip. The owner of the latter had nothing to do but to abandon his lot or build a house 5 feet wide upon it. The latter course was perhaps adopted because such a house would shut up all the side windows of the neighboring building and considerably reduce its value.

The new building, which has been finished for some months, is, therefore, 5 feet wide, 100 feet deep and four stories high. It is divided into two houses, each 50 feet long, and the entrance doors are, of course, on the avenue, as there is no room for a door at either end of the building. The law allows a building at the corner of a street to have projecting bay windows along the side, and, taking advantage of this circumstance, the architect has managed to plan a house which, while peculiar in inside appearance, and probably very uncomfortable to live in, may find tenants. Without these bay windows or square projections running from the foundations to the roof it would not have been possible to build a house at all, for no room would have been wider than 3 feet. Each house has, therefore, two bay windows, in one of which are the stairs and in the other one room about 8 feet wide by 15 feet long, upon each floor. The long passage between the stair-well and the room is about 3 feet wide. Each house contains a kitchen 8 by 15 feet and four rooms, each of the same size, but on different floors. The building is a source of wonder to all who see it.

If the object of the builder of this extraordinary house was simply to shut out the light from his neighbor's building, he would probably have accomplished the same end at much less expense by adopting Mr. George Kemp's device of sheet-iron shields. Mr. Kemp did not wish the occupants of the building in the rear of his house, at No. 720 Fifth avenue, to overlook his premises, and so he built an iron scaffolding in his back yard and placed iron shields against the obnoxious openings, shutting out air and light as completely as a brick wall would have done.

### Seven-Room Frame House.

Among the studies submitted in the Eleventh Competition, as has already been mentioned in these columns, we received several sets of drawings which, so far as their general merits were concerned, were entitled to a position in the first rank, but which, on the other hand, on account of some variation from the printed specification, were thrown out by the Committee of Award. The fact, however, that these drawings embody features not anticipated in the original specification of the competition does not make them any less desirable for publication. The set of plans presented herewith were submitted in the contest referred to by Mr. T. F. Schneider, of Washington City, D. C. The failure of recognition at the hands of the Committee of Award was principally, as we have been since informed, on account of the change in the position of the window in the store-room and the addition of the projecting balcony on the front elevation in the second story. By comparing the front elevation (Fig. 4) and the second-floor plan (Fig. 3), the change indulged in by the architect will be understood by our readers. While unquestionably he has presented an elevation more attractive to the eye than it would be without some such addition, we cannot but indorse the action of the committee in considering the set of plans outside of

DESIGN SUBMITTED IN THE ELEVENTH COMPETITION BY T. F. SCHNEIDER, ARCHITECT, WASHINGTON CITY, D. C.

the competition. In most other respects Mr. Schneider has kept his work inside the limitations and has considered this design very carefully in all respects. He has given it such attention as to make it very desirable for presentation to our readers.

In the author's description accompanying the plans the statement is made that he has designed this house as a cheap building, and at the same time has endeavored to produce something tasteful. The roof is so arranged as to give a good attic, and at the same time contribute a pleasant effect to the exterior appearance of the house. Referring to the introduction of the second-story balcony and change in the window, the author remarks that it will be noticed, by reference to the floor plan, that the window in the store-room is placed on the side, leaving a dead space on the front of the building. This, he thinks, should not be so, and therefore he has located it on the front, and has constructed a balcony in the recess. Concerning the advantages of this balcony, the author directs attention to its usefulness as a conveuient place in which to lay things for airing or to deposit them while occasionally cleaning the store-room.

In the dining-room a cheap but neat looking sideboard has been introduced, as shown in Fig. 13. Mirrors are intended to be used in the angles ,as shown. Above the curtain-rods in the arch, the panel is to be finished with curtain stuff of a color to suit the taste and to harmonize with the trimmings of the room. It is hardly necessary to further particularize with reference to this design, as the elevations and details, which are engraved direct from the author's drawings by photo-process, fully convey his meaning and are sufficient for the execution of the work at the hands of a practical mechanic.

*Fig. 4.—Front Elevation.—Scale, ⅛ Inch to the Foot.*

## How Granite Columns are Polished.

The word "granite" generally conveys the idea of roughness, coarseness and solidity. The idea of finish, smoothness and polish does not, in the popular mind, belong to the material. But most kinds of granite are susceptible of a beautiful and almost faultless surface finish. The effect of this finish, in contrast with the hammered faced granite, on monuments where a tablet is surface polished, or lines of lettering are in brilliant contrast with the dull gray of the unpolished stone, is very fine—especially so when the shafts of columns are thus finished, the bases being hammered and the capitals carved. As this finish can now be obtained by machinery at a low cost, the possibilities of obdurate granite for ornamental as well as for building purposes have been greatly enlarged.

Granite columns, vases and similar cylindrical ornaments are polished in a lathe. This differs but little from an ordinary machinist's lathe, except that a continuous bed is not necessary to hold the lathe heads; that the spindle of the foot-stock revolves as well as that of the head-stock, and that no tool carriage and appurtenances are required. The head-stock is furnished, like that of the ordinary back-geared lathe, with a back shaft, on which is the driving pulley, or the cone of step pulleys, from which the spindle is driven by means of a gear and pinion, the surface speed of a column under process of grinding and polishing being from 230 to 240 feet per minute, giving to a 12-inch column about 77 turns per minute, and to a 36-inch column about 25 turns per minute.

To center and swing a column in the lathe, the stone has a square recess cut in each end, into which is fitted a block of cast iron with a round hole through its center. The place of this block is found by means of a cross of wood, with sliding arms on each of the four limbs of the cross, the arms projecting over the surface of the column longitudinally, and when equidistant from the center denoting the place of the center block, so that the true center of the column or shaft is found, just as it is on an iron shaft, from the circumference. The iron block is secured in place by a running of Babbitt metal, or a similar unshrinking compound, around it. The centers of the lathe spindles fit the holes in the blocks, and when swung in the lathe the column is rotated by means of a lug or dog on the face-plate engaging with one seated in the end of the column.

Back of the lathe is a wall of plank against which rest the ends of a number of iron blocks, 3 or 4 inches diameter, long enough to project over the column and to have their rear ends resting against the bulkhead or wall. Their under sides are concaved to embrace the column one-fourth of its diameter or less, and as the motion of the column in grinding is reverse to that of the ordinary lathe, the blocks are held against the wall by the rotation of the column. These blocks are arranged closely side by side, and when the column is first worked its irregularities of chiseling and unevenness of contour make

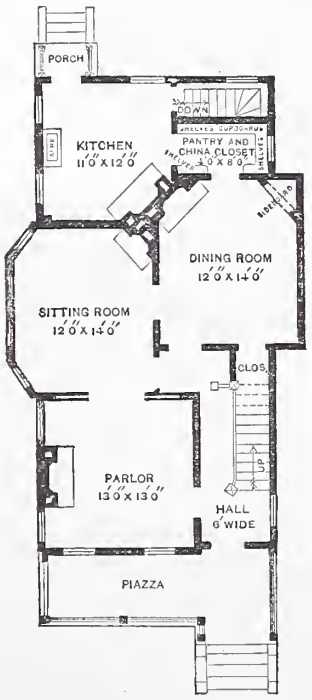



*Fig. 2.—First Floor Plan.*

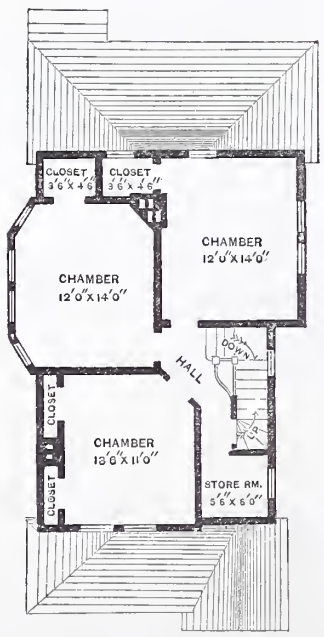
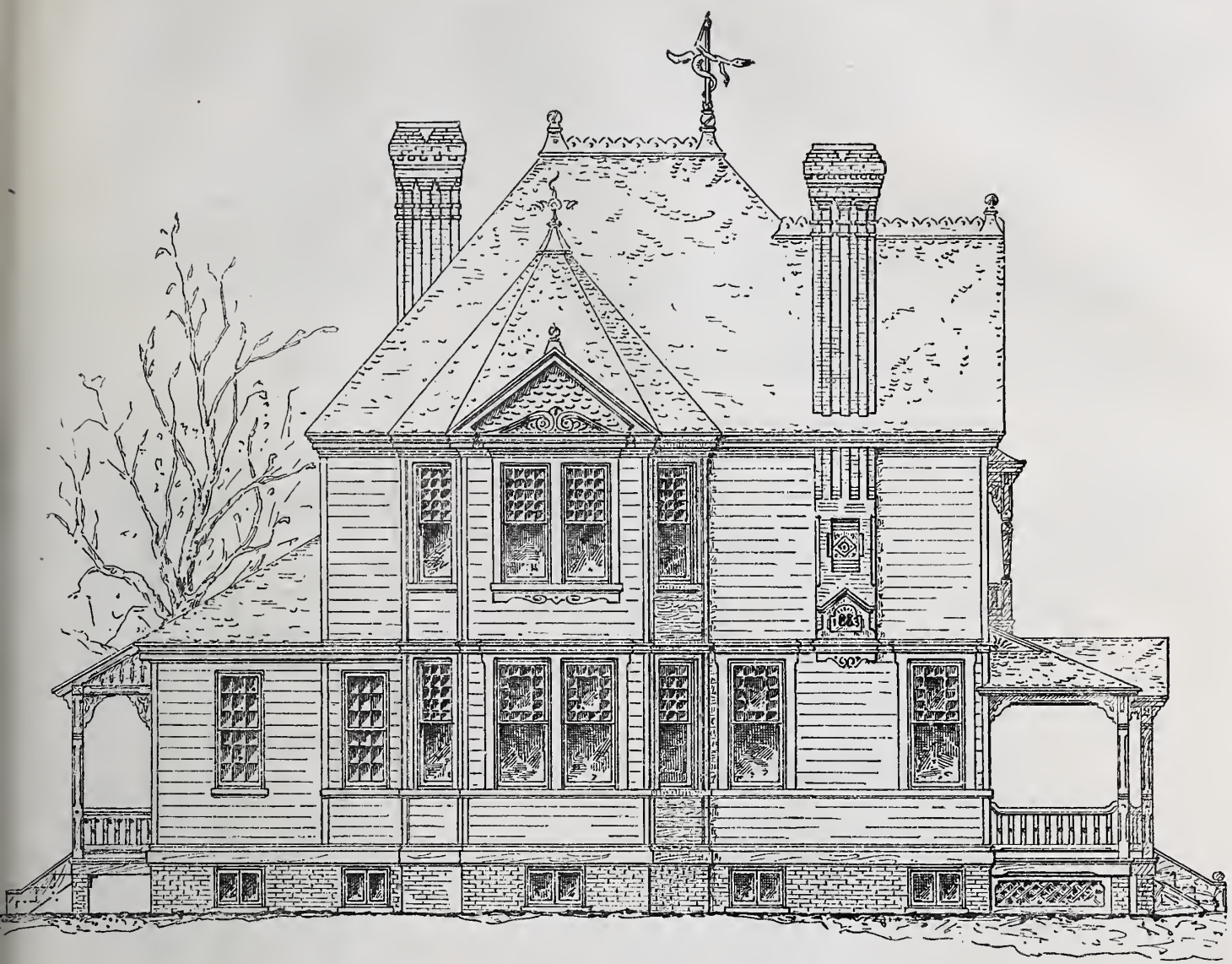



*Fig. 3.—Second Floor Plan.*

*Eleventh Competition.—Floor Plans.—Scale, $\frac{1}{16}$ Inch to the Foot.*



*Eleventh Competition.—Fig. 5.—Side Elevation.—Scale, ⅛ Inch to the Foot.*

these blocks play up and down like the movements of pianoforte keys under the fingers of a performer. But as the grinding progresses this irregular movement becomes a very slight undulation, pleasant to see. A trough runs under the column its entire length, and from it an attendant shovels beach sand and water on the revolving column, the blocks with their concave faces

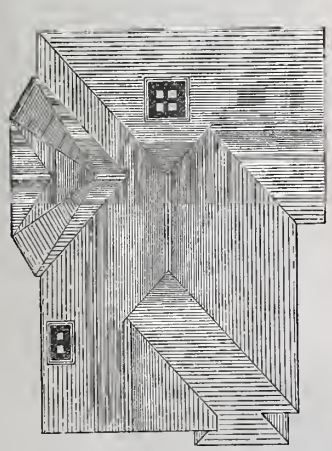


*Fig. 6.—Roof Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.*

acting as griuders, just as the hinge clamps of the machinists are used in polishing a turned shaft; and, like the clamps, the series of blocks are occasionally pushed along one-half of their width to avoid rings of roughness. This quartz sand is used until all the bruises, "stunts" and chisel marks are taken out and the surface shows a uniform color. Then the trough is cleaned and emery of the numbers 40 to 60, according to quality of stone, is weighed out in the proportion of about ½ pound to every superficial foot; thus, a column of 10 feet in length by 3 feet in diameter — 90 superficial feet—would require from 45 to 50 pounds. This is all weighed out at one time, and is never added to during the entire process. Mixed with water, it is fed to the grinders by the shovelful, over and over, until the grinding is entirely completed. The reason for this is evident from the fact that, in using, the emery becomes ground up and mixed with the *detritus* of the granite and the particles of the iron blocks or grinders, and after a time is a pasty mass, losing much of its original sharp grittiness. If, now, fresh, unused emery was added, the effect would be to scratch the half-finished surface.

When the grinding is finished the common cast-iron grinding blocks are removed and others are substituted, having their embracing under sides faced with felt. To these is fed the ordinary marble polish of oxide of tin and water until the surface of the column shines like glass and reflects like a mirror. The entire time required to polish granite columns—dependent on the exactness of their chiseling—is from 40 to 50 hours, diameter and length making but little change, as the work is simultaneous and the surface speed a constant.

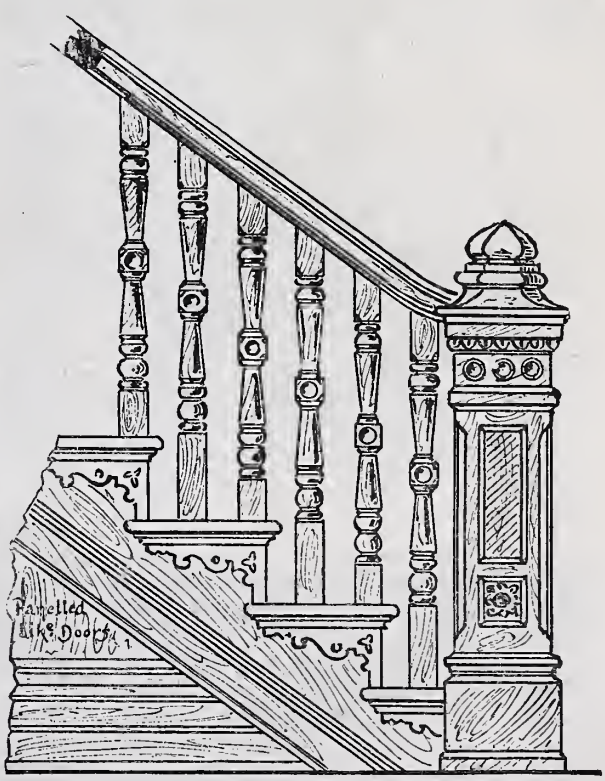
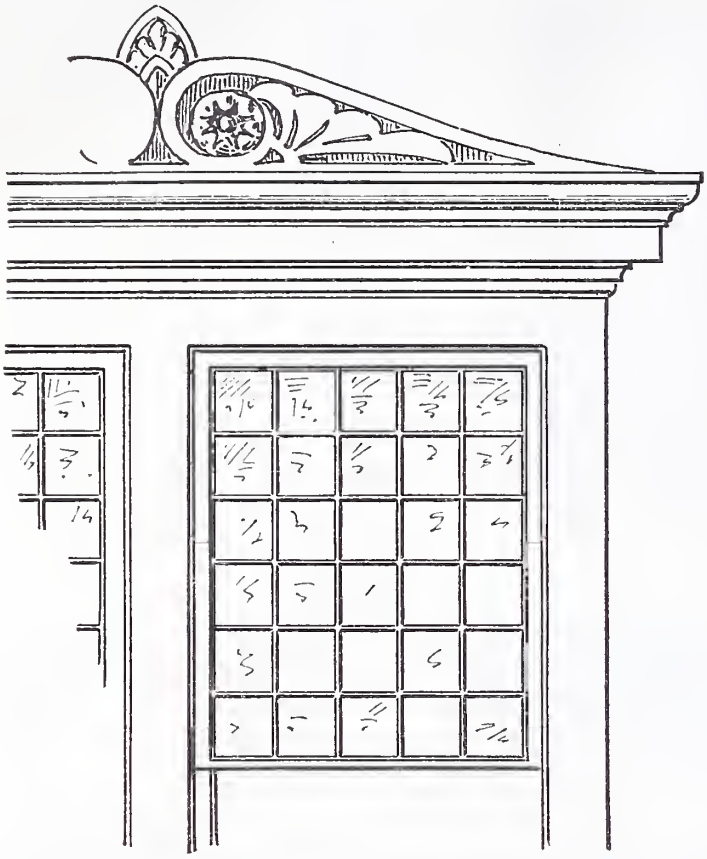



*Fig. 7.—Foot of Stairway.—Scale, ¾ Inch to the Foot.*

## The Chicago Exposition.

Among the displays made at the Chicago Exposition during the month of September which are of special interest to the readers of *Carpentry and Building* may be mentioned that of the Northwestern Terra Cotta Works, of that city. This exhibit, embracing both gray and red terra-cotta, included chimney tops, both large and small, specimens of belt courses, roof crestings, rosettes, tile and fancy brickwork. Vases, grotesque heads and other odd pieces of work were also shown in profusion. The whole exhibit was arranged in such a manner as to be very attractive, and commanded the attention of all interested in architectural work. A very fine specimen of German tiling for wainscoting for use in bathrooms kitchens and the like was among the goods shown.



*Eleventh Competition.—Fig. 8.—Twin Windows in Bay, Second Story.—Scale, ¾ Inch to the Foot.*

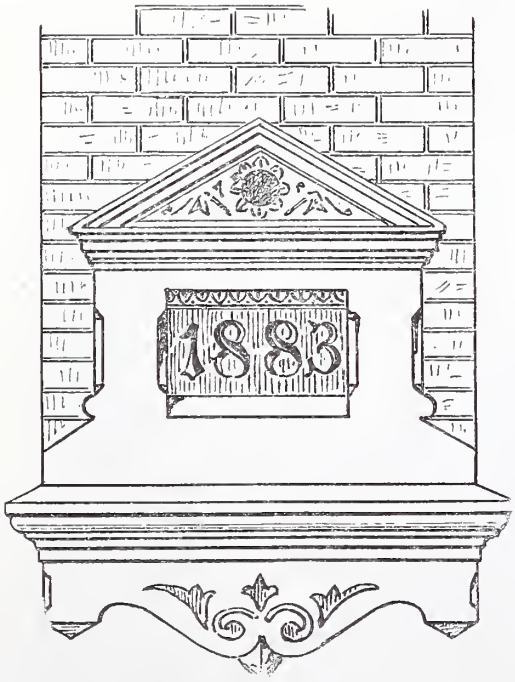



*Fig. 9.—Chimney.—Scale, ¾ Inch to the Foot.*

Messrs. Champlin & Spencer, whose specialties have already been mentioned in our columns, exhibited a combined circular saw and boring machine, a foot and hand power circular rip and cross-cut saw, the Acme adjustable countersink, and other small goods.

The Chicago Wire and Iron Works, No. 110 Lake street, Chicago, being a branch of B. T. Barnum, of Detroit, made a display of wire and cast-iron fencing, roof crestings, sand screens, window guards, flower stands, settees and other similar goods.

The Burlington Manufacturing Company, No. 200 Michigan avenue, Chicago, made a display of marble mantels, tiling and one or two specimens of monumental work.

Henry Dibble, Nos. 266 and 268 Wabash avenue, Chicago, had a handsome display of wood and marble mantels, grates, brass goods, tile, &c. The shape of the space in which the goods were displayed was oblong; three mantels arranged in triangular form were placed at each corner of the space, while in a diamond-shaped space brass goods were arranged in the center, thus constituting a display which revealed new features of interest to the visitor as seen from different points of view. The wood mantels embodied some very handsome designs, and the grates, fenders and brasswork shown in connection with them gave evidence of good taste and careful selection on the part of those who arranged the exhibit.

Chas. L. Page, Nos. 337 and 339 Wabash avenue, also made a handsome display of wooden mantels, grates and tile. In plan this exhibit was not unlike the letter H, the cross line, however, being very much thickened. Along the face of the exhibit and at the sides mantels were set flat, while in the recess at the ends they were so placed as to give the appearance of an alcove or small room. A number of very handsome designs were displayed.

The Western Sand Blast Company, whose office is at the corner of Clinton and Jackson streets, Chicago, had a pavilion constructed almost entirely of glass, exhibiting specimens of the decorative work peculiar to their process. Designs suited to vestibule doors, transoms, windows, screens, and for various other purposes, were shown. Some very handsome pieces of embossed railroad glass were in the exhibit.

Messrs. Brown Bros., corner of Clinton and Jackson streets, Chicago, manufacturers of sidewalk and vault lights, arranged some of their goods in the form of a square pyramid of some 20 feet in hight, which formed a conspicuous feature near the center of the main building. The goods displayed consisted of sidewalk lights, mostly hexagonal in shape, graded in size so as to make the figure symmetrical in appearance.

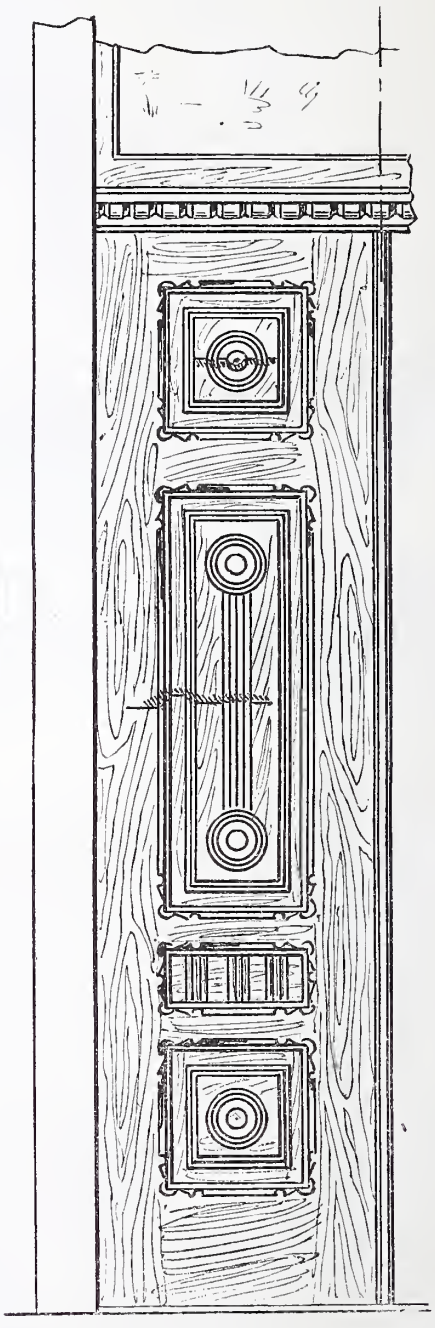
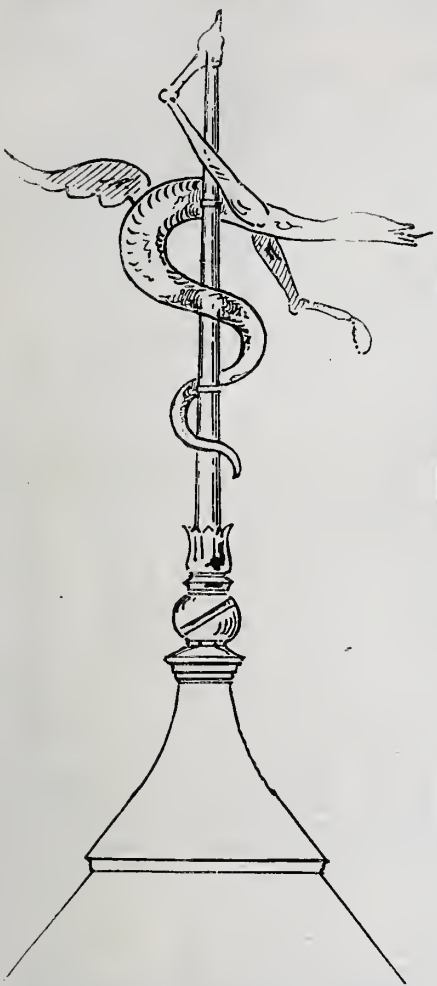


*Fig. 10.—Detail of Front Door.—Scale, ¾ Inch to the Foot.*

Messrs. Eaton & Prince, of No. 74 Michigan street, Chicago, exhibited a hoisting engine with safety attachment for preventing accident in case of breakage of cable or other parts of machinery. They also had a working model of an elevator drawn by screw hoist, which was provided with an automatic check against falling, in case of accident to the hoisting cable. The nature of this device will be understood from the statement that it consists of clamps held away from the guides on which the elevator runs, and controlled by a governor kept in motion by a rope running over pulleys on the car. An increase of speed above the limit to which the governor is set causes the balls of the governor to fly out by centrif-

ugal force in such a way as to throw the clamps into position against the guides. The action of the parts is such that with an ordinary load a drop of only a very few inches



*Eleventh Competition.—Fig.* 11.—*Weather Vane.—Scale, ¾ Inch to the Foot.*

occurs after cutting the rope. It is not claimed for this improvement that it will stop the elevator instantly, but rather will

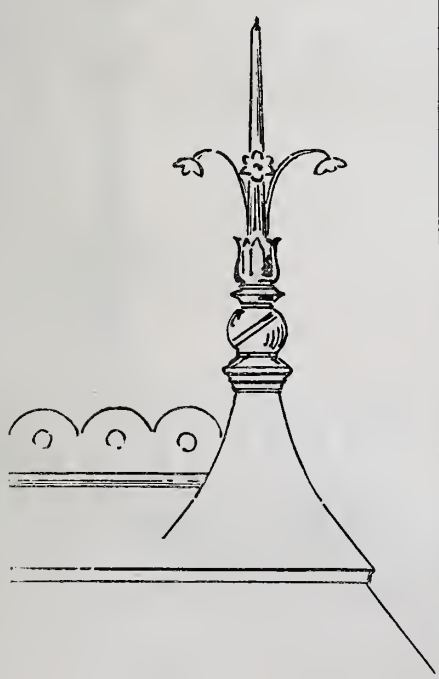


*Fig.* 12.—*Finial and Cresting.—Scale, ¾ Inch to the Foot.*

stop it slowly in a way to prevent damage to parts which otherwise might be injured.

A conspicuous feature of the exposition was the brick and tile machinery shown by several different manufacturers. The Western Brick and Tile Manufacturing Company, of Chicago, exhibited working machines made under Gregg's patents. They also showed a large number of specimens of molded brick, illustrating the capacity of the machine shown. In addition to the manufacture of machines, this company offer to test clays, sending back sample bricks on receipt of a barrel of clay from any locality. By this means the adaptability of the material at any point can be determined for working in a machine of the kind offered. Frey, Sheckler & Hoover, of Bucyrus, Ohio, exhibited what they called the Centennial brick and tile machine. This machine, which has already received many premiums and high honors where exhibited, was shown in working order, and commanded marked attention upon the part of builders who visited the exposition. In the same inclosure a hand-pressing machine made by C. T. Drake & Co., of Chicago, was shown.

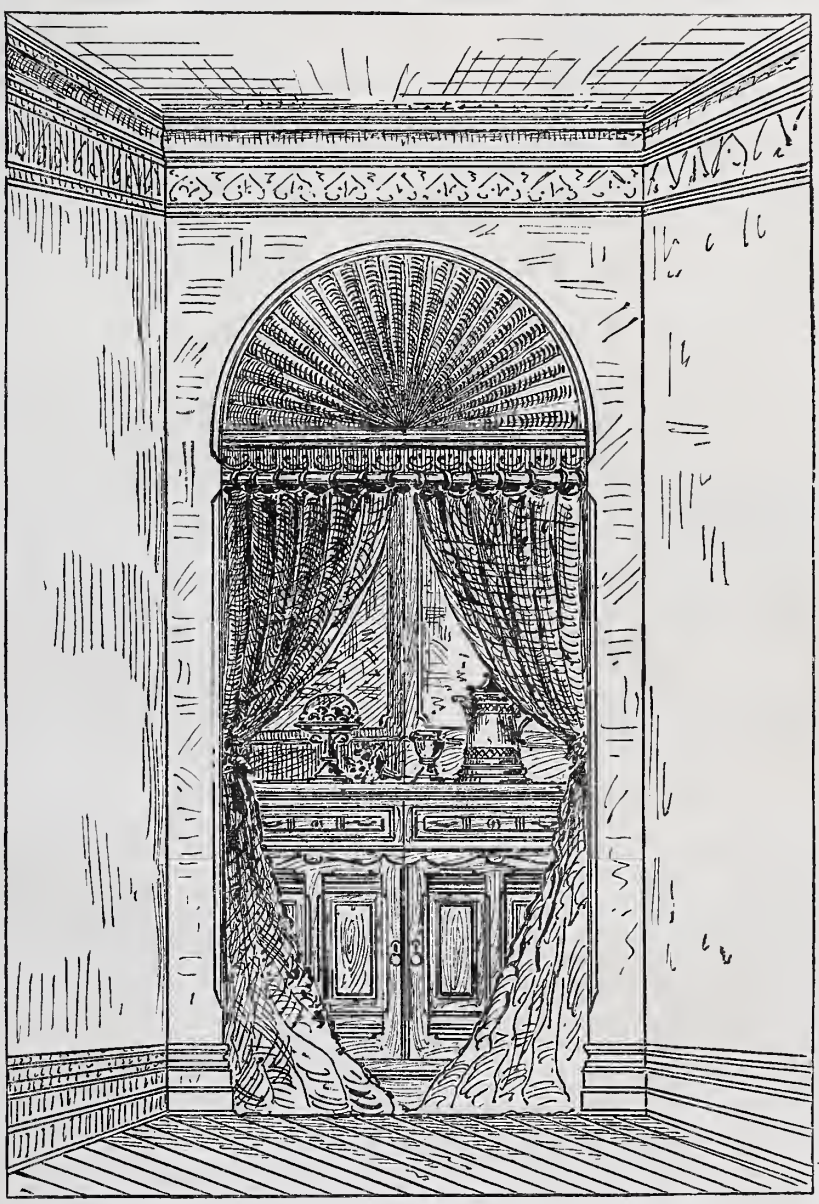


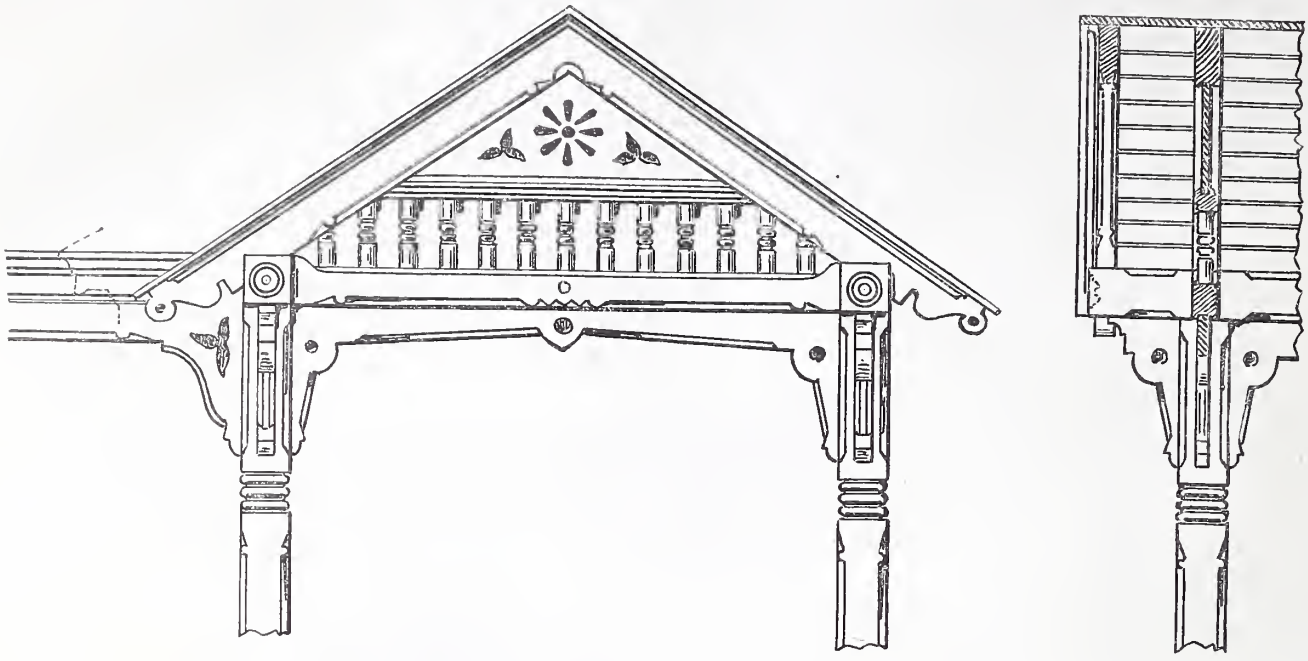
*Fig.* 13.—*Sideboard in Dining-Room.—Scale, ½ Inch to the Foot.*

In an apartment specially constructed for the purpose a fine display of Spur's paper veneer was made. This apartment, which both in its exterior and interior was cabinet finish, was entirely constructed of wood faced with this veneer. Specimen cards, printed on the veneers, were freely distributed to visitors. One of the handsomest specimens of cabinet finish that has ever been made at any exposition which we have visited was shown by the Goss & Phillips Manufacturing Company, of Chicago. It consisted of two apartments, one of which represented a hall with a staircase in oak, with wainscot finish and mantel, with brass-trimmed grate, chandelier and other appurtenances befitting such a room. The second room was finished in mahogany, displaying sliding doors, window trimmings and elaborate wood mantels and other features. These two apartments were lighted by incandescent electric lights of the Swan variety, run by Brush storage batteries.

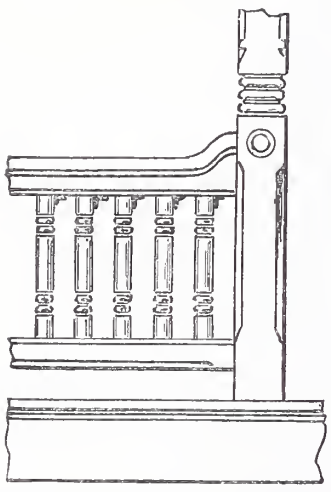
## Architecture in New York.

BY MONTGOMERY SCHUYLER.

In this country, which has never been much more, architecturally, than an English colony, there seemed special reasons for following the new fashion of being old-fashioned. American architects, and American builders before there were any American architects, had been exhorted, as they have lately been exhorted again, to do something distinctively American. The Colonial building, which was done by trained English mechanics, was of the same character as the contemporary domestic work of England, and showed in its ornament the same unreflecting acceptance of a set of forms and formulæ bequeathed as a tradition of the trade and part of the outfit of a journeyman. Although Jefferson complained that in his time and in rural Virginia it was impossible to "find a workman who could draw an order," it is evident that there was no difficulty of that kind in other parts of the country. These trained workmen, it is to be noted, were all carpenters, and there is probably no work in stone which shows an equal precision and facility in workmanship. Such buildings as the New York City Hall and the Albany Academy were clearly the work of architects of culture, according to the standard of the



*Eleventh Competition.—Fig. 14.—Details of Veranda.—Scale, ½ Inch to the Foot.*



time. The only architectural qualities of the work of the mechanics were the moderation and respectability of detail which they had learned as part of their trade, and it is quite absurd to ascribe to these buildings any value as works of art. It is particularly absurd to assign the degradation of house-building which undoubtedly followed, and which made the typical American house, after the Greek temple had spent its force, the most vulgar habitation ever built by man, to the substitution of book-learned architects for handicraftsmen. People talk as if the middle part of Fifth avenue, the brownstone, high-stoop house, with bloated detail, which displaced the prim precision of the older work, had been done by educated architects. In fact, there was probably not a building put up in New York after the design of an educated architect between the works we have mentioned and the erection of Trinity Church by Mr. Upjohn, in 1845, which not only marked a great advance over anything that had been done before, but began the Gothic revival to which we directly or indirectly owe whatever of merit has been done since, including so much of Queen Anne as, not being Queen Anne, is good. But the bulk of the building which gave its architectural character to New York and to the country continued to be done by mechanics, who continued, as far as they could, to supply the demand of the market, who gradually lost the training their predecessors had enjoyed, and who lost also all sense of the necessity for that training in the new demand that their work should be, above all things, "American." As the slang of to-day puts it, they were exhorted—as the architects are still sometimes exhorted—to "talk United States." They might have answered that there was no such language, and that a few bits of slang did not constitute a poetical vocabulary. The feeling which urges an artist to be patriotic, by being different from other people, not long ago led Mr. Walt Whitman to resent the absence of an "autochthonous" poetry, and has lately led a newspaper writer to call the attention of a New England building committee to the log cabin as the most suitable model for a town hall they are going to build.

The Northern reader notes with mild amusement the occasional resentment in the Southern press of the absence of a "distinctive Southern literature," and perceives the plaint to be provincial; but he is not so quick to perceive that his own clamor for an American this or that is equally provincial. The hard lot of the American painter has lately been bewailed, in that, when he has tried to rid himself of his provincialism by learning to paint, and has learned to paint more or less as other men do who have learned to paint, he is straightway berated for not being provincial. If American literature, or painting or architecture is good, the Americanism of it may safely be left to take care of itself. But a man cannot expect to innovate to much purpose upon usages with which he is unfamiliar; and the effects which Mr. Whitman's admonition to his fellow poets to "fix their verses to the gauge of the round globe" would probably have upon an aspiring young poet, conscious of genius, but weak in his parts of speech, are the effects which the demand for aboriginality actually had upon the race of builders, whether they were content with that title, or without any sufficient provocation described themselves as architects. They undoubtedly attained difference, and their works did not remind the traveled observer of any of the masterpieces of Europe. It is quite conceivable, and not at all discreditable, that the wild work of Broadway and Fifth Avenue should have led architects of sensibility to cast many longing, lingering looks behind at the decorum of the Bowling Green and Washington Square, and to sigh for a return of the times when the common street architecture of New York was sober and respectable, even if it was conventional and stupid. This justifiable preference for Bowling Green and Washington Square and St. John's Park over Broadway and Madison Square and Murray Hill, for an architecture confessedly colonial over an architecture aggressively provincial, is no doubt the explanation why so many of our younger architects made haste to fall in behind the Queen Anne standard. What we really have a right to blame them for is for not so far analyzing their own emotions as to discover that the qualities they admired in the older work, or admired by comparison with the newer, were not dependent upon the actual details in which they found them.

## The Twelfth Competition.

We take pleasure in acknowledging a number of very fine efforts submitted in the Twelfth Competition. At the time of going to press no announcement of a decision has been made by the gentlemen to whom the question of a decision in this contest has been referred. We expect to lay the result before our readers in the next issue.

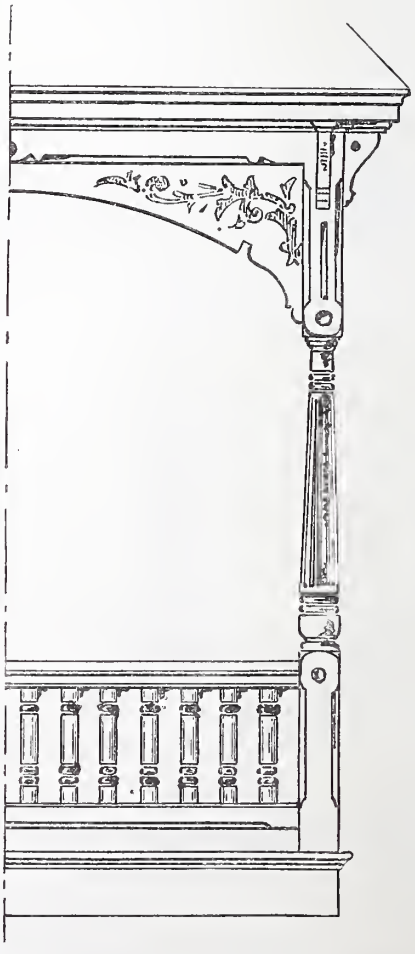


*Fig. 15.—Balcony in Second Story.—Scale, ½ Inch to the Foot.*

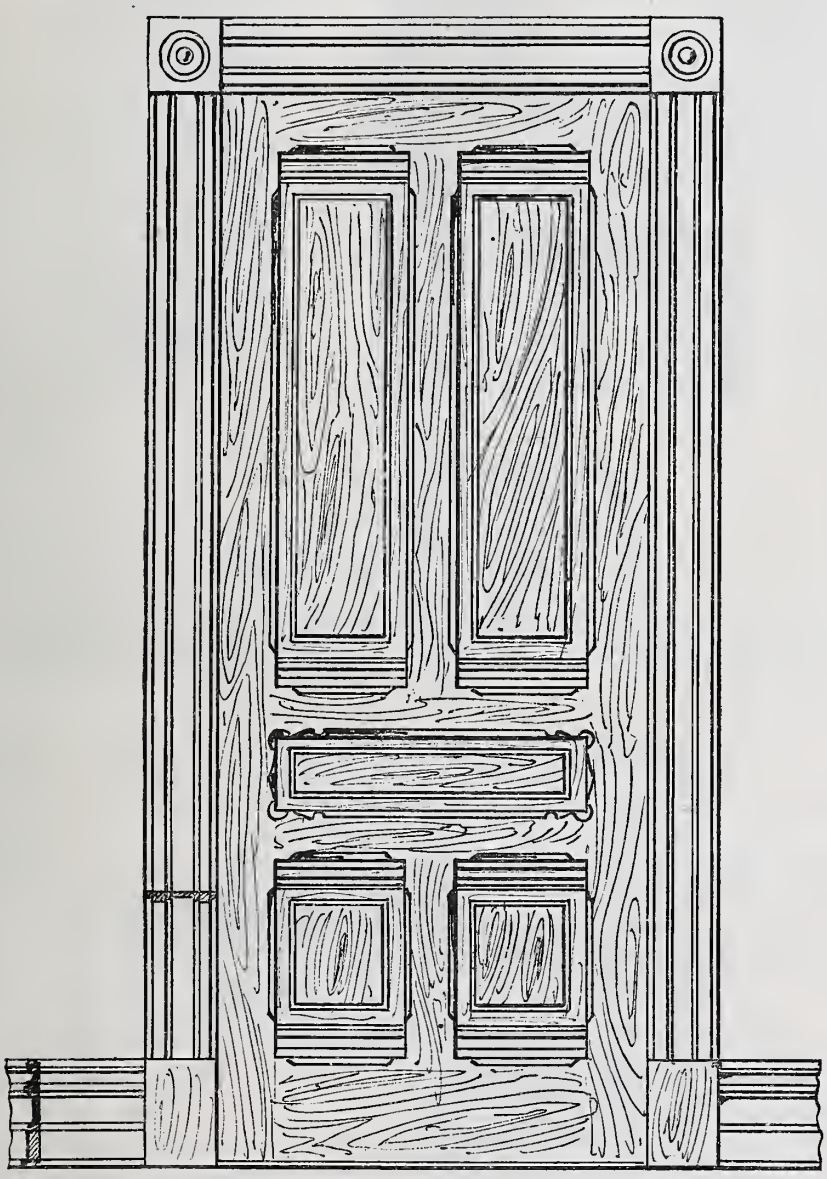
Among the designs submitted is a set of plans marked "Rex," not accompanied, however, by the envelope, called for

in the specification, containing the address of the author. As this part was probably mislaid before sending, or, if sent, lost in the mail, we request the author of the plans mentioned to forward the necessary particulars for identification to this office at his earliest convenience.

## TRADE PUBLICATIONS.

### A New Fire-Escape.

The large number of disastrous conflagrations with which this country has been visited during years past—notably in a comparatively recent period—have induced many inventors to consider the subject of fire-escapes to be used under various circumstances and conditions. Mr. S. J. Pardessus, of Nos. 9 and 11 Park Place, New York City, has devised what he calls a "Double-passage quick-fire-reach and practical fire-escape." In general terms this may be described as a spiral passageway around a central shaft, so arranged as to produce an easy inclined roadway in combination with a central space for ventilation. This spiral passageway communicates at each story with the floors of the building in which it is placed, and is provided with fire-proof doors working in slides, balanced in such a manner as to enable persons to escape from the building, but yet preventing the spread of fire. It would be difficult to convey an intelligent idea of this inventor's plans without engravings. In order to present his notion intelligently to the building public, Mr. Pardessus has issued a neat little pamphlet, in which his invention is fully described and illustrated. We suggest that those who are interested in this subject will serve their own interests by procuring a copy of this pamphlet, which is sent free to all applicants.



*Eleventh Competition.—Fig. 16.—Inside Doors and Trimmings.—Scale, ¾ Inch to the Foot.*

### Stained Glass.

We have received from Messrs. J. & R. Lamb, 59 Carmine street, New York, a neat pamphlet describing stained glass for church and household work. The pamphlet is profusely illustrated with designs of some of the patterns which this firm are prepared to supply. At the outset there appears an essay on stained glass by Mr. C. R. Lamb, in which brief reference is made to some of the processes through which glass is passed in the process of staining. A number of single and double windows and figure subjects are given, among which may be mentioned the presentation of "Christ in the Temple" and "The Elders of the Church Administering to the Sick." The Garfield memorial window erected in St. James's Church, at Long Branch, is shown, and a number of other memorial designs are presented. Door-lights and transoms are treated, as are also chandeliers and lanterns, and a number of designs for stained-glass fire-screens are presented. Throughout prices are mentioned, so that the book is one of special interest to those who have occasion to use work of this kind.

### Wood-Working Machinery.

We have received from the Battle Creek Machine Company, Battle Creek, Mich., an illustrated catalogue of molding, paneling, carving, dovetailing and other wood-working machinery manufactured by the company named. The specialties of this establishment are the Boult machines. Specimens of work, of furniture and cabinet finish done upon the Boult molder are shown, and a general view of the machine at work is presented, together with details, cutters and other prominent parts. The utility of this machine is so generally recognized by wood workers that it is hardly necessary to enter into a description. Suffice it to say that the pamphlet before us gives information which any person proposing to purchase a machine of this kind would require, and therefore it should be in the hands of all managers of wood-working establishments. Boult's molding machine, with dovetailing attachment, Boult's independent dovetailer, and also Boult's double and single shaper are similarly shown and explained. Various other tools are presented, together with designs of steel cutters for doing various classes of work. The pamphlet closes with a large number of testimonials and a list of names of those who have purchased machines.

## Old Building Material.

An extensive trade in second-hand material has been carried on in this city for many years, being largely supported by builders and joiners. The stone and brick of an old building are used in the construction of a new one, the lime-whitened bricks making the inside of the outer walls and the partitions, and the stone going into the foundations. But it may not be generally known that the inside woodwork is used again, frequently without radical alteration. Many builders prefer this old timber because it is thoroughly seasoned, having been defended from the weather and been subjected to the influences of a measurably even temperature for years. The richer woods which are admired for their color acquire mellower tones by age. Everybody knows that furniture of mahogany and rosewood that has outlived several generations is much handsomer than that made from new wood. An article made from the old wood will remain in its integrity in all its joints; its shrinking days are over. For the same reason the timbering, wainscoting and flooring of old buildings have an added value, although their selling price is less than that of new material.

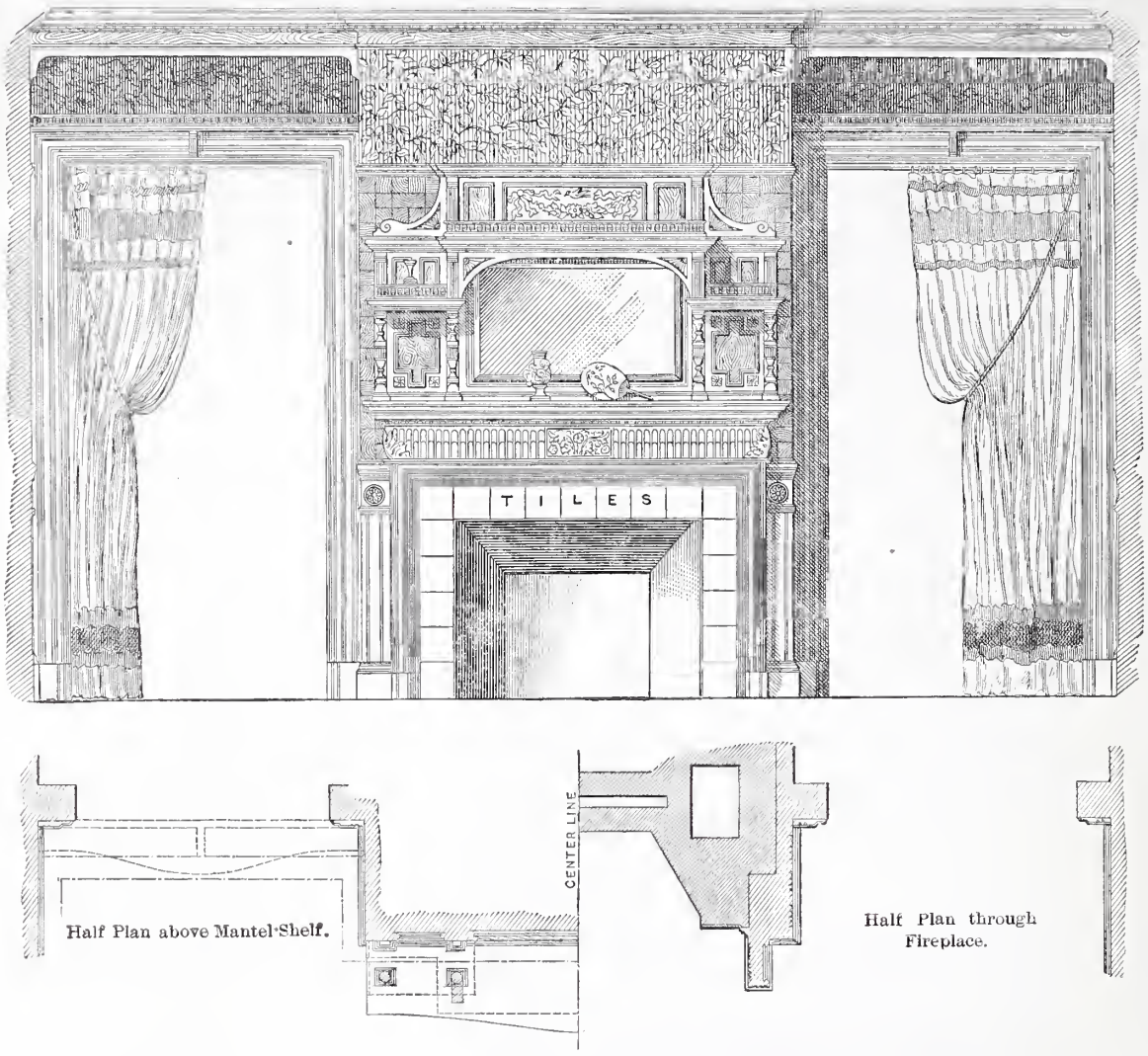
## Iron as a Building Material.

The *American Architect* in a recent issue has some remarks in regard to the use of iron as a building material which are worth consideration by mechanics, machinists, and, in fact, by every one who has anything to do with construction in iron:

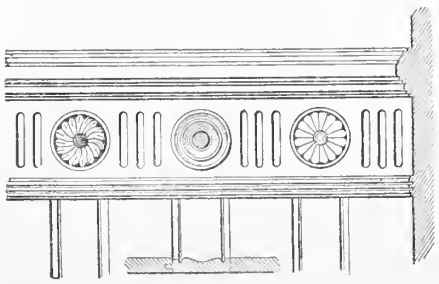
Of all comparatively new materials, the modern architect has to take chief account of iron. Its remarkable qualities, its power of resisting compression, its wonderful tensile strength, render it one of the most useful servants of the building constructor. Its cheapness, too, when these qualities are taken into consideration, is another powerful factor in favor of its use. On the other hand, we know that it has certain inherent defects, such as its oxidation when exposed to the action of the air, and its rapid and total loss of strength when subjected to a very high temperature. This points to its being protected, both from the action of a damp atmosphere and from the effects of fire, by some impervious coating of cement or plaster. This application of plaster to the soffit of a wrought iron beam, or as a casing to a cast or wrought-iron column, is as common sense and intelligent a use of the material employed as the coating of a stucco to a Doric column formed of coarse calcareous breccia. Only let the column from its delicacy proclaim its iron core, and there will be no false construction about it, and as much true art perception may be shown in the treatment of its plaster covering as we admire in the exquisite lines of the Doric column.

With regard to the safety of iron thus treated in the case of the severest fires, we have had already some proof. As, however, it is impossible to make any material absolutely air-proof, it is as well always to give excess of thickness to all parts of an iron structure, even to those not subjected to any

strain, so as to allow for a reasonable amount of oxidation, as, for instance, to the web of a beam (its neutral axis), being neither subjected to the compression experienced by its upper flange, nor the tension experienced by its lower. When the formula for the construction of wrought-iron beams was first discovered, beams were made of a web of almost gossamer thickness. Such beams, I have heard an engineer remark, should be kept in vacuum at a uniform temperature of 60° F., and then they would doubtless continue to perform their functions for an indefinite time; but such not being the conditions in which they find themselves, they must sooner or later yield to circumstances. It behooves us, therefore, in the employment of iron, to take account of atmospheric deterioration, and also to be aware of the two great facilities it gives of superimposing great weights over voids, as of walls many stories in hight dividing a number of small apartments above one large one. Such is not desirable construction, though it may have sometimes to be resorted to, and is one of the evils begotten of competition, when, in order to fulfill the instructions to the letter, many expedients have been resorted to, which a skillful constructor, if unshackled by such conditions, would know how to avoid. Moreover, however carefully you may case your iron, so as to cause it to retain much of its power during a fire, you can hardly so isolate it from heat as to prevent its serious expansion and the consequent disturbance of the stability of your walls.




*A Study in Suburban Architecture.—Chimney Piece in Dining-Room.—Scale, ⅜ Inch to the Foot.*



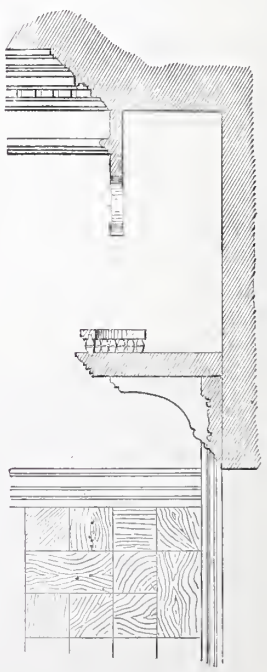
*Detail of Cap of Wainscoting.—Scale, 1 Inch to the Foot.*

## A Study in Suburban Architecture.*

BY AN ARCHITECT.

### More of the Dining-Room.

The dining-room would be lacking in cheerfulness on a cold winter morning if we did not have the open fire, and the fireplace must have its mantel. The mantel is designed as a companion piece for the sideboard before described, and is to be executed in oak and slightly stained in the finishing. The fire-back is to be of cast iron and the facings of bluish-green tile, with an old brass border. The hearth will be of tile in colors of dull blue-green and claret, with some black and gold in the border. The chimney-breast will be treated, as was that in the sitting-room, with small squares of hardwood nicely jointed. A small projecting shelf for decorative purposes appears above the doors at either side of the chimney-piece. The whole scheme of the decoration of the dining-room is to furnish a strong, rich background for snowy table-linen and shining silverware, and not until the table is set does the entire effect present itself.



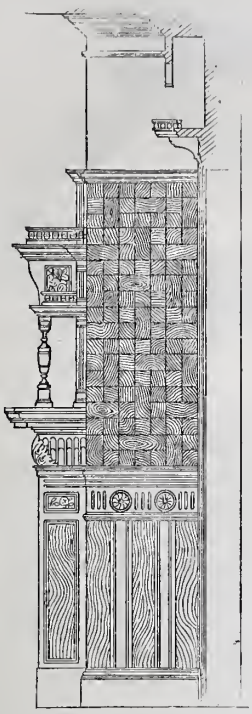
*Section Through Shelf Over Doors.—Scale, 1 Inch to the Foot.*

## Stained Floors.

The popularity of stained floors goes on increasing. Nowhere are they more appreciated than in sleeping-rooms, where sweetness and freshness are the main considerations. Just what is the best stain is a difficult question to decide. A writer in a contemporary is of opinion that permanganate of potash is the best. It is much used in the navy, and is very satisfactory in sitting-rooms and sleeping-rooms. As most people know, permanganate of potash not only stains, but purifies and disinfects the rooms

* The illustrations in this series of papers are from drawings prepared by Messrs. Gould & Angell, architects, of Providence, R. I.

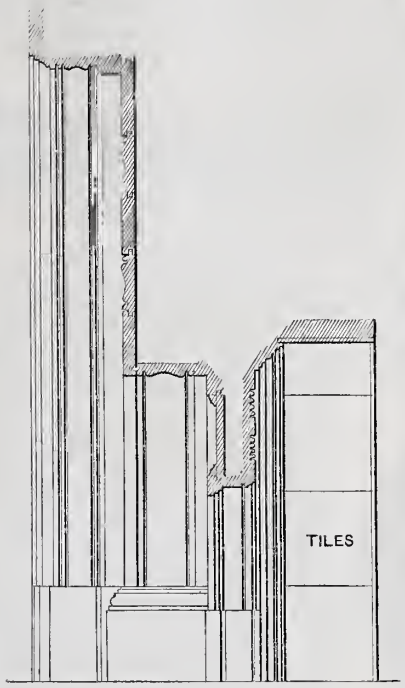
which are stained. The mode of procedure is this: Procure a good quality permanganate potash; dissolve about 1½ ounces of the crystals in a gallon of boiling water—this will make quite a dark stain; use a



*Study in Suburban Architecture.—Side View of Chimney Piece.—Scale, ⅜ Inch to the Foot.*

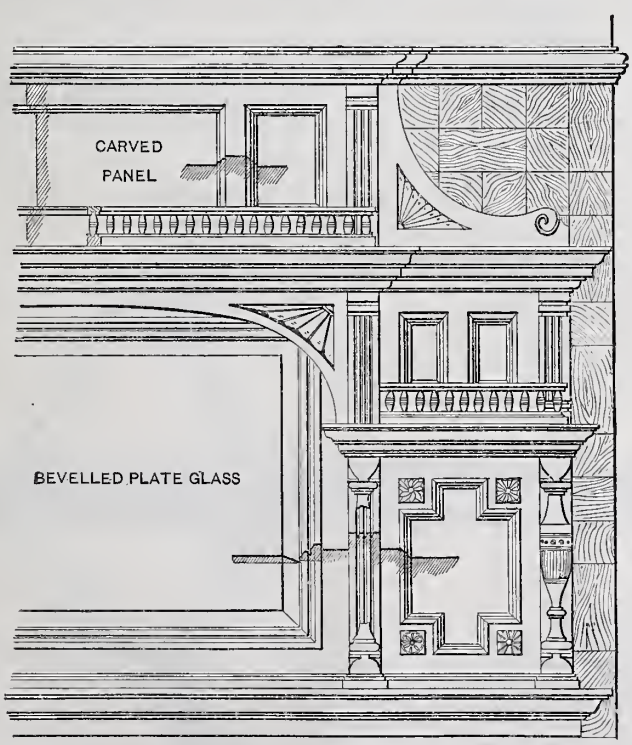
stick to stir up the mixture; then, with a painter's flat brush, lay on the stain, working the way of the grain of wood quickly and boldly. A small brush is useful for corners and crevices, and a pair of heavy gloves should be worn while at work, as the permanganate stains very considerably. Salts of lemon or lemon juice will, however, quickly remove the stains from the hands. When dry, the staining can be repeated if the color is not dark enough, and then, when perfectly dry, the floor should be rubbed dry with an old duster, and linseed-oil should be rubbed on freely with a piece of flannel, always applying it with the grain of the wood. Two or three layers of the oil are an improvement, and firmly set the stain.

The floor is then ready to be polished with becswax and turpentine. To prepare this, spread or cut up the wax into small pieces; put it into a gallipot and pour sufficient spirits of turpentine over it just to cover it. Set the pot in the oven or on the stove until the wax is thoroughly melted, then set it aside



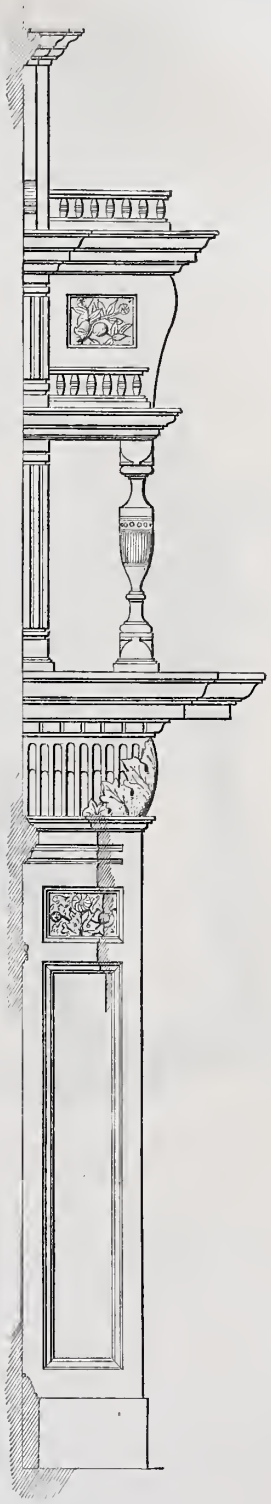

*Section Below Mantel Shelf.—Scale, 1 Inch to the Foot.*

to get cold, when it should be of the consistency of pomatum. Put on the wax, not too much of it, with a piece of flannel, and polish with a polishing brush or a big silk duster.




*Detail of Work Above Mantel Shelf.—Scale, 1 Inch to the Foot.*

This mode of treating floors is quite the best and most wholesome for bedrooms, which should be stained all over, under the beds and everywhere. They can be kept very clean and bright with a daily rubbing with the duster, and a weekly application of bees-wax and turpentine. Turpentine is cleansing, and floors so treated do not require the weekly scrubbing which is so objectionable in cold and wet weather. Some people object that these floors require so much labor, but after they are once well polished the labor is not more than scrubbing floors and washing oilcloths, and they take away two-thirds of the terrors of house cleaning. Those who like the more common varnished floors should stain the floors as above; but instead of the linseed oil a coat of size should be laid on. This can be obtained at the paint shops,

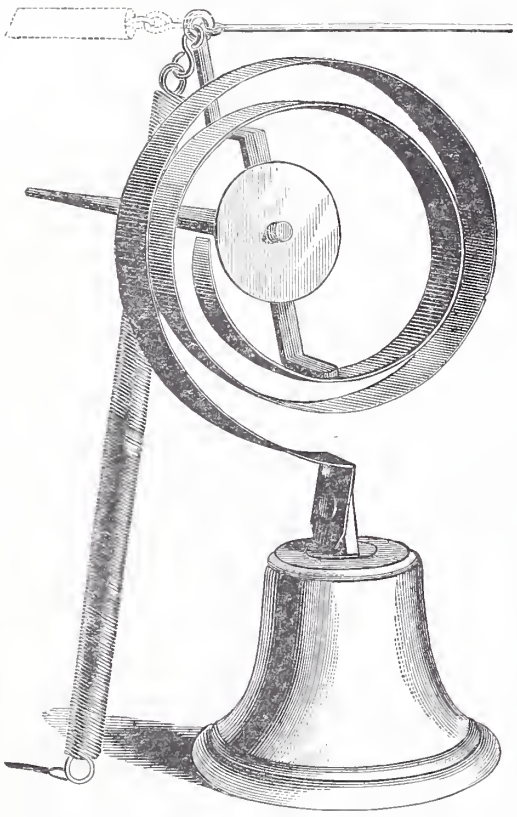


*Side of Mantel.—Scale, 1 Inch to the Foot.*

and should be dissolved in boiling water to the consistency of thin gum, and then laid on with the brush evenly and with the grain. When the size is perfectly dry and hard it can be varnished with one or two coats of copal or egg-shell flat varnish. These floors require to be dusted daily, and to have a little linseed oil rubbed in occasionally. These require less care than a waxed floor, but when they get shabby they are not so readily renovated. A flannel bag, in which the broom can be incased, is the best floor duster and one most easily managed.

## The Art of Bell-Hanging.

In every well-regulated household the door bell is a necessity. In large houses some means of signaling from different rooms, such as parlor and chambers, to the kitchen and other portions of the house, is also a necessity. Accordingly, it follows that a means of fitting up a house with bell-fixtures is one in which many are interested. Bell-hanging is seldom a separate trade. It is frequently combined with gas-fitting and plumbing, sometimes tinsmiths do the work, and not unfrequently it is done by locksmiths. Bell-hanging may be described as a simple trade, there being little about it which any mechanic of intelligence cannot pick up on very short notice. The tools required are such as are ordinarily employed in the plumbing and gas-fitting trade, and a carpenter also has nearly all in his chest that are ever employed in work of this kind. Accordingly, to have a bell at the front door one does not always need to apply to a professional bell-hanger. Fixtures for almost every conceivable position are staple goods and are kept in stock by many hardware dealers. One or two establishments issue special catalogues of bell-hangers' materials. In giving some general directions for doing work of this kind, and which we conceive will be of value to our readers, we shall refer freely to such catalogues, and shall borrow many of our illustrations from them, because, in showing the kind of goods to be had in the market, we shall more readily put into the hands of our readers methods of doing such work as may come up. Most of the illustrations which we shall employ in these articles are from the establishment of Messrs. J. B. Shannon & Sons, 1009 Market street, Philadelphia, Pa. This concern not only issues a catalogue of bell-hangers' materials, but it backs up this line of business by a thorough familiarity with all the details of the trade, so that the goods are intelligently presented and the wants of professionals and amateurs carefully considered.



*The Art of Bell Hanging.—Fig. 1.—Bell, Showing Check Spring.*

First, with reference to the tools that are necessary to use in putting up a front-door bell. At the outset we may remark that in this description we refer not to a gong bell attached directly to the door and worked by a crank, but a bell located in a hall or somewhere in the rear of the house, connection with which is made by a wire operated by a pull on the outside of the door. The tools needed are an anger or bit $\frac{7}{16}$ or ½ inch in diameter; a wood-cutting chisel ¾ inch wide or less, for the purpose of letting in the pull; an odd piece of $\frac{5}{16}$-inch square iron, used in fitting the pull, as will be described further on; an ordinary screw-wrench, 6 or 8 inches in length, for screwing up the pull, as will also be described, a gimlet and a screw-driver. A pair of pliers with which to manage the wire will be found necessary, and a hammer for driving up the crank and mounting the bell must also be provided.

Referring now to the fixtures required for putting up a bell, a mounted bell, as shown in Fig. 1 of our engravings, may be bought in the way we have described. As shown in the cut, the wire is attached to what is known as the carriage, and the position of the check-spring, as it would be when the bell is put in position, is shown by the dotted lines. The complete spring is dropped down behind the bell simply for economy in space in representing the article. The use of the check-spring in a bell of this kind is to resist the pull when the hand is upon the knob or handle outside the door. In other words, after pulling out the knob or handle, the check-spring acts upon the wire and draws it back to place. Inasmuch as the wire in some cases is of considerable length, involving in many instances several angles, it is necessary that the check-spring should be reliable in its action, and strong enough to overcome the friction and resistance which it is intended to counteract. Pulling the bell forward and letting go the knob gives the check-spring an opportunity to act, and this motion, by means of the spiral spring shown above the bell, causes the ringing.

Another important item in fitting up bells is that of the crank, which may be described as a device for turning an angle with the wire. These are mounted at the side or end of the crankshank, as circumstances may require. In Fig. 2 an end bell crank of the ordinary pattern is shown, while in Fig. 3 a side bell crank mounted on a side shank is shown. Cranks are also mounted on plates. With all the variety of fixtures that are provided by dealers, it sometimes happens that none of them are convenient for use, and that it is necessary to mount a crank to suit the occasion.

Front-door pulls are of great variety. They may be had in what is known as mineral, also in porcelain and brass, besides many styles of bronze metal. Sometimes they are made to fit a molded front-door jamb. In Fig. 5, a porcelain bell-pull is shown, which in design is similar to those in general use. The parts of which it consists are so clearly shown in the engraving that it will be sufficient to illustrate all the directions we have to give. When a jamb is too narrow to allow a bell pull to be put upon its front, it is sometimes placed on the side, and a special fixture of the kind shown in Fig. 4 is then employed.

In Fig. 6 an imaginary sketch is presented through the front hall of a dwelling. The position of the bell-pull and the plate which fits against the jamb, the pulley around which runs the chain connecting the shank of the bell-pull with the wire, the bell crank in the corner next the ceiling and a staple for holding the wire in place, together with the bell as it would be put up in the rear of the hall, are all clearly represented. With the fixtures before the reader, as we have described them in detail, and this sketch showing the position when properly combined, we will proceed to give some general directions for doing the work. The first matter to be attended to is boring through the jamb at, say, 4 feet above the step or porch floor. For this purpose a bit $\frac{7}{16}$ inch or ½ inch in diameter should be employed. After the hole has been bored go inside the door, and if the bell is to hang near the ceiling, bore with the same auger two holes 2 inches deep close above the one first made through the jamb, for the purpose of mortising in the pulley. After the pulley is let in, drive a crank in a straight line above the pulley and as near the ceiling as it is proposed to put the bell. The crank must be in as straight a line above the pulley and the jamb as the wall will admit of, in order to have the bell ring easily. If there be no more than one crank required to lead to the bell, as we have shown in the imaginary sketch through a front hall, just put the bell in its place, with the eye of the carriage about level with the wire and check-spring, so that the wire, when run from the crank to the bell, will be parallel with the ceiling. Have the check-spring attached to the carriage of the bell before the bell is put up. For fastening the opposite end of the check-spring in place, have a staple or hook or nail for driving into the wall. Place the check-spring so that it will hold the carriage of the bell a little out of plumb from the front of the house, so that when the wire is attached the the weight of the wire and the strain to hold the wire level will about bring the carriage to a plumb position. A mounted bell, as we have already described, is a machine in itself; it is moved one way by drawing ont the bell-pull, and moved the other way by being drawn back by the check-spring, and thereby made to ring. A good check-spring is necessary, since it draws back the bell-pull and wire.

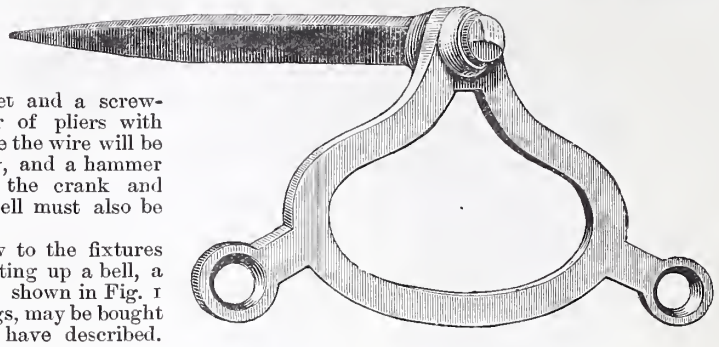


*Fig. 2.—An End Bell Crank.*

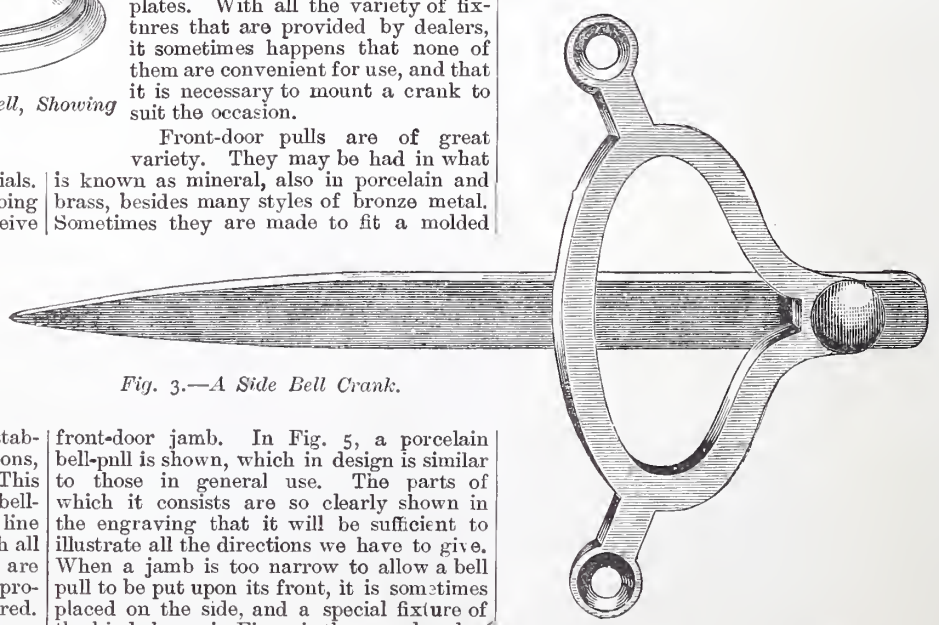
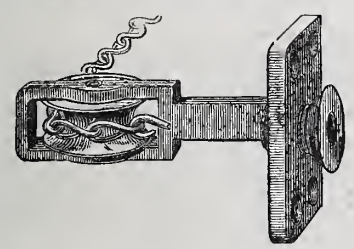


*Fig. 3.—A Side Bell Crank.*

After the crank and bell are put in place so as to determine the lines, go back to the front door and fit in the pull. To do this,

take the spindle of the pull out of the screw in which it works. The odd piece of ¼-inch iron mentioned in the commencement of this article is required at this point. If the spindle of the pull is used to do the fitting-up—that is, screwing the plate in position—it may be that the spindle will become twisted. A twisted spindle is more troublesome to straighten by far than the work or time required to save it from such damage; hence our advice to use an odd piece of iron instead of the spindle for the work to be done. The hole in the jamb must be small enough to allow the screw of the pull to cut a thread as it is driven home. Care must be taken that the hole is not too large, for in that case the screw of the pull would not cut a thread in the hole. In some instances a blacksmith's tap may be employed for the purpose of cutting a thread in the jamb for the bell-pull, but this is seldom necessary. If the pull will not hold firmly in this way, a piece of metal should be used having a hole cut in it for the pull, and with a thread cut in the hole to fit the screw of the pull. A couple of screw-holes should also be provided in the plate, by means of which to fasten it to the jamb of the door. It should be small enough to be entirely hidden by the base of the pull when all is put in place.

After the pull is made to work satisfactorily, go inside and fit in the pulley around which the chain works, shown in the sketch. Be careful to clear away all chips and pieces from the hole after letting in the pulley. A very small piece of shaving or chip will sometimes seriously interfere with the working of the bell, and accordingly make trouble. Attach to the pull spindle a piece of wire that will reach to within 2 inches of the inside of the jamb, and to this wire attach the bell chain to run over the pulley. Then screw up the pull to remain in position; screw the pulley into its place, and test all that has so far been done, to see that it works clearly and freely. A check-spring made fast to the chain and tacked to the jamb over the pulley is a good means by which to test the pull and pulley and see that all works as it should. The next work is to stretch the wire, by making one end fast to something that is permanent and then unrolling as much as will be wanted, or as much as there is room to stretch. Take the other end in the pliers and pull as hard as possible. The wire, if free from defects, will stand all the stretching that can be given it in this way, and, as a result, will be free from kinks and bad spots. If it will not stand this treatment, it is unsatisfactory for use and should be rejected. To fit up a bell with wire that will stretch after it is in position is no credit to the one who does the work. No. 17 or 18 annealed iron wire is the size usually employed for hanging bells. Copper wire is employed in damp places, on account of the liability of iron wire to rust. The great objection to copper wire is that it never gets done stretching, and accordingly is unsatisfactory for the purpose. Attach a piece of this stretched wire to the chain of the pulley, having the chain long enough, so that when the pull is drawn out the chain will remain on the pulley; then lead the wire up and attach it to the crank above the pulley. The crank should lean slightly toward the pull. Then run the wire from the crank to the bell, and fasten the end into the eye of the carriage, drawing the wire short enough to have a little strain on the check-spring. Staples should be employed to hold the weight of the wire, one staple being placed in each 8 or 10 feet of length. Be careful, in the use of staples, not to drive them in too closely, or so that they bind the wire. Do not use too many staples, for the friction on them will make the bell work hard



*The Art of Bell Hanging.—Fig. 4.—Side Jamb Rigging.*

The front-door pull should be provided with a stop, so that it cannot be pulled out more than a short distance, or more than is actually necessary for agitating the bell. In the engraving of the bell-pull presented herewith the stop is shown, and the best fixtures are all provided either with the stop, as here represented, or a hole through which a wire or nail may be driven, which answers the same purpose. A bell-pull without this stop frequently results in disaster to the wire by being drawn out an unreasonable distance. Hanging a front-door bell is only one position in which a bell may be used, and at another time we shall give attention to some of the fixtures and means of putting in place bells in the inside of a house.

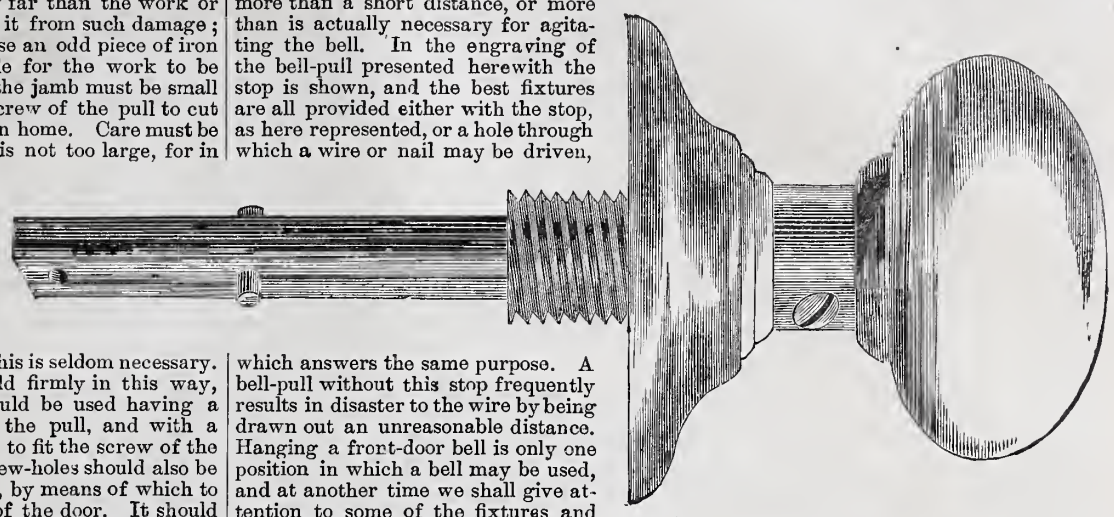


*Fig. 5.—A Porcelain Bell Pull, Showing Screw Thread for Fastening in Place, Stop, and Hole for Attaching Wire.*

**Tools Used in Building the Pyramids.**—During a residence of two winters in a tomb at Gihez, Mr. W. M. Flinders Petrie collected evidence showing that the tools used in working stone 4000 years ago were constructed with a jewel as the cutting edge. He stated his reasons for coming to this conclusion in a paper read before the Anthropological Institute, a *resumé* of which is published in a recent issue of *Engineering* of London. Solid and tubular drills, straight and circular disk saws and lathe tools were made with jewels set in metal. The lines of cutting on granite core made by a tubular drill form a continuous spiral, the grooves being of a uniform depth and width throughout, showing that the cutting point was not worn as the work advanced. The regular taper of the core would indicate that jewels were also set upon the outside and inside of the drill, thereby facilitating its removal. In some specimens of granite the drills sank $\frac{1}{10}$ inch at each revolution, and the pressure necessary to do this must have been from 1 to 2 tons. The skill of the workmen and the capacity of the tool are illustrated by the clean path through both soft and hard material—no difference in the groove being perceptible, although it passes from a soft substance into quartz, subjecting the tool to an enormous strain. In plane surfaces the depth and width of the cuts indicate the successive stroke of a saw, and the use of the circular saw is proved by the regularly curved lines. The forms of the tools were the same that experience has sanctioned at the present day. The scarcity of the diamond and the lack of strength in the sapphire and beryl led to the consideration of corundum. Nothing has been found out about the metal of which the tool was made or the method of setting the jewel.

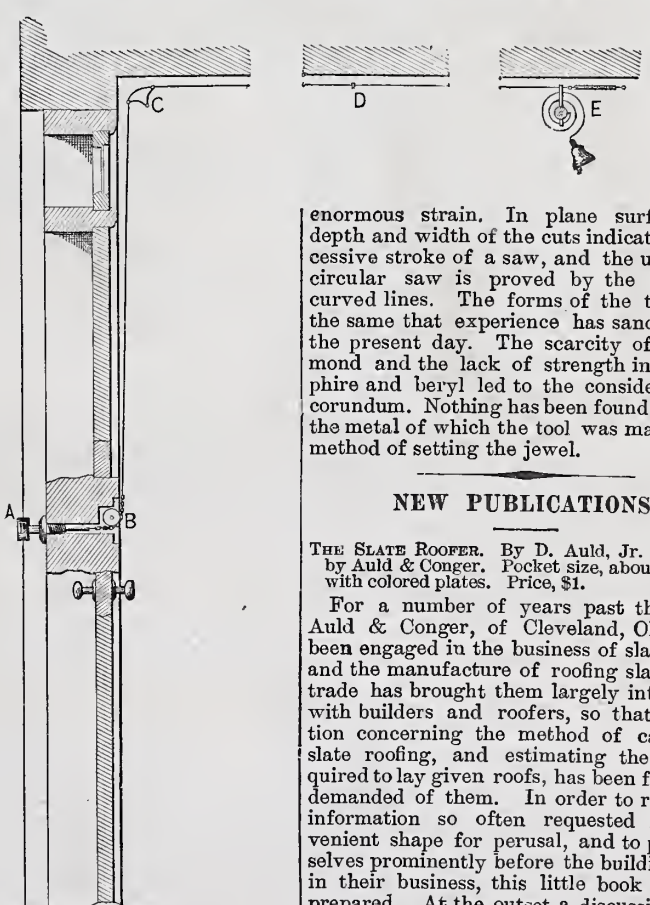



*Fig. 6.—Section Through the Front Hall of a Building, Showing Bell Pull, Bell Pulley, Bell Crank and Bell in Position.*

## NEW PUBLICATIONS.

THE SLATE ROOFER. By D. Auld, Jr. Published by Auld & Conger. Pocket size, about 50 pages, with colored plates. Price, $1.

For a number of years past the firm of Auld & Conger, of Cleveland, Ohio, have been engaged in the business of slate roofing and the manufacture of roofing slate. Their trade has brought them largely into contact with builders and roofers, so that information concerning the method of calculating slate roofing, and estimating the slate required to lay given roofs, has been frequently demanded of them. In order to reduce the information so often requested into convenient shape for perusal, and to put themselves prominently before the building public in their business, this little book has been prepared. At the outset a discussion of the kinds of buildings which are adapted for receiving slate roofs, with considerations of the sizes of slates best adapted for roofing, together with rules for measuring slate roofing, directions for flashing and counter flashing, and remarks about scaffolding and repairing appear. Following this a number of slate tables are given, showing the number of slates required for laying different roofs, using different sizes of slate. These tables are in very convenient form for reference and are much better adapted to the use of builders and roofers than anything

which has heretofore appeared. In the latter part of the book a number of diagrams are given showing the use of cut slate, and greatly facilitating the calculations necessary to be made in working slate into ornamental patterns where both colored slates and cut slates are employed. The usefulness of this part of the book is hardly to be overrated, since calculations of the kind that it facilitates are necessary to make in almost every roof that is laid. This, so far as we know, is the first attempt which has ever been made to reduce such calculations to a definite system or to offer a means by which the calculation can readily be made by those who are engaged in practical work. The diagrams cover not only fancy patterns, but also to some extent enter into the formation of letters and figures. An advertisement of the Lightning Slate Dresser, manufactured by the firm, together with illustrations of a complete outfit of slaters' tools, appear at the close of the book. These two items are of interest to builders, since the art of laying slate is easily acquired and one which it is to the advantage of builders generally to be acquainted with. Slate roofers are at times difficult to obtain, and where small jobs are to be done the expense is altogether out of proportion to the service rendered. Hence, every builder becoming his own slate roofer, so to speak, is no small advantage, and it is to assist just such effort that this book has been prepared.

PAINTING AND PAINTERS' MATERIALS. By Charles L. Condit, under the supervision of Jacob Scheller. Published by the *Railroad Gazette*. Size, 5 x 7½ inches; 465 pages. Colored frontispiece and several illustrations. Price $2.25.

This work is written entirely from a practical point of view, evidently by a practical man who has the rare addition to his practical knowledge of a pretty thorough understanding of the scientific side of his art, and, what is still more unusual, the desire to put the scientific knowledge into a shape which will be both intelligible and useful to his non-scientific and practical brother. A large portion of the matter made its appearance in the *Railroad Gazette* in the form of a series of articles on various subjects connected with the art of painting. We think it would be difficult for any painter, architect, builder, or, in fact, any one who has to do with painting, to read this book through from beginning to end and not have a clearer idea of the nature and functions of paint and a better understanding of the way in which paint and varnish should be applied. In fact, any one who has painting to do, whether employer or employee, will find an advantage from a familiarity with the work. The chapters on the quality of varnish and its manufacture, oils of all kinds, including drying and non-drying oils, are very useful. The protection of iron is another chapter which is worth reading. The painter who is interested in the protection of durable work will find the chapter on pigments, &c., including the changes in the various colors and the artist's palette, a decided aid. The colors named and the directions given are very practical in their way, and are sufficiently simple for almost any one to understand easily.

The construction of the granite sea-wall at Governor's Island, New York Harbor, the contract for which was given out last November, is progressing rapidly. This wall will be, when finished, 1750 feet long and 8 feet in hight. It will be built of granite blocks in courses, resting upon a concrete foundation laid in an excavated trench, at or near the mean low-water line. This wall starts at the coal wharf, near the main landing, and running generally in a southerly direction, terminates near the South Battery. The granite for this wall is now quarried, and is all first-class material, free from intrinsic defects. Seven courses will complete the wall, which will be 2½ feet wide on the top and 3½ feet wide on the bottom. It will be laid in cement and backed by concrete. The filling behind the wall is estimated at 40,000 cubic yards, and the area of land so gained will be utilized for the necessary buildings. This wall, in accordance with the contract, was to be completed by the 1st of November.

## The Strains in a Howe Truss.

So many of our readers have requested us to give in the columns of *Carpentry and Building* an easy and convenient method of finding the strains in the different members of a Howe truss, that we have concluded to add one more to the series of articles on "Calculating Strains" which appeared in Nos. 42, 43, 44, 46 and 58.

Those of our readers who have followed the application of the graphic method to strain calculations in girders and roof trusses will find no difficulty in understanding what follows; those who have not we must refer to their back numbers, as it is simply impossible to bring the whole subject within the scope of a single article.

Let it be required to find the strains in the Howe truss *a* A B....*r*, Fig. 1, and let

$l$ = 200 feet, the length of the truss.
$h$ = 18.75 feet, the hight of the truss.
$p$ = 12.5 feet, the length of one panel, and
$w$ = 75 tons, the weight of the truss.
$w_1$ = 150 tons, the total moving load; then will

W = 225 tons, the whole load, dead and live combined, and uniformly distributed.

It will be remembered that we have shown that the bending moment of a beam which is uniformly loaded is greatest at the middle, and is equal, if W be the total load, to the supporting force at one abutment = ½ W multiplied by its lever arm = ½ $l$, less the weight on the half-span = ½ W multiplied by its lever arm taken from the center of gravity = ¼ $l$; or the moment M is equal to:

$$M = \tfrac{1}{2}\,W \times \tfrac{1}{2}\,l - \tfrac{1}{2}\,W \times \tfrac{1}{4}\,l = \frac{W\,l}{8}$$

or is equal to one-eighth of the product of the load multiplied by the span; hence the maximum strain in one chord of a truss of the height $h$ is at the middle of the span equal to:

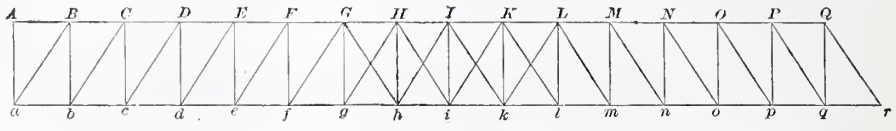
$$\frac{W\,l}{8\,h}.$$

Applying this to the truss under consideration, we obtain for the greatest tension in the middle of the lower chord:

$$\frac{W\,l}{8\,h} = \frac{225 \times 200}{8 \times 18.75} = 300 \text{ tons.}$$

To find now the strains in the different parts of the truss, and commencing with the chord strains, we proceed as follows by the graphic method:

Lay off the horizontal line *a r*, Fig. 2, by any convenient scale, equal to the span of the truss, in this case equal to 200 feet. Next mark on this line *a r* the points 1, 2, 3, ..... corresponding to the panel points, *b*, *c*, *d*, ..... in Fig. 1. Next—as we have done heretofore—assume a load scale, say of 30 tons to the inch, and by this scale plot the line *o*–8 = 300 tons, from the middle of and perpendicular to *a r*. From the point *a* drop another perpendicular, *a*–8, equal in length to *o*–8, and divide this line into as many equal




*Strains in a Howe Truss.—Fig. 1.—Diagrams of Howe Truss of 200 Feet Span, Hight of Truss, 18.75 Feet; Length of Panels, 12.5 Feet.*

parts as there are panels in the half truss. Then drop perpendiculars from the points 1, 2, 3, 4, .....on the line *a*–*r*; draw 0–1, 0–2, 0–3, 0–4, ..... and the points *a*, *b*, *c*, *d*, *e*, *f*, *g*, where these lines cut the verticals, dropped from the panel points, will then determine the strains in each panel of the chord from the abutment to the middle of the truss.

It is easy to see that the points *a*, *b*, *c*, *d*, .... ..... lie in a parabola, which has its origin at *o*. The other half of the curve may be completed in the same way.

Applying now the scale of 30 tons to the inch, to the measurements of 1–*a*, 2–*b*, 3–*c*, 4–*d*, ..... we obtain the following chord strains, which for convenience we have tabulated:

| Strain diagram, Fig. 2. | Strains in tons. | Tension in members of Fig. 1. | Compression in members of Fig. 1. |
|---|---|---|---|
| 1–*a* | 70.3 | *a b* and *q r* | B C and P Q |
| 2 *b* | 131.2 | *b c* and *p q* | C D and O P |
| 3–*c* | 182.8 | *c d* and *o p* | D E and N O |
| 4–*d* | 225.0 | *d e* and *n o* | E F and M N |
| 5–*e* | 257.8 | *e f* and *m n* | F G and L M |
| 6–*f* | 281.2 | *f g* and *l m* | G H and K L |
| 7–*g* | 295.3 | *g h* and *k l* | H I and I K |
| 8–*o* | 300. | *h i* and *i k* | .. ..... |

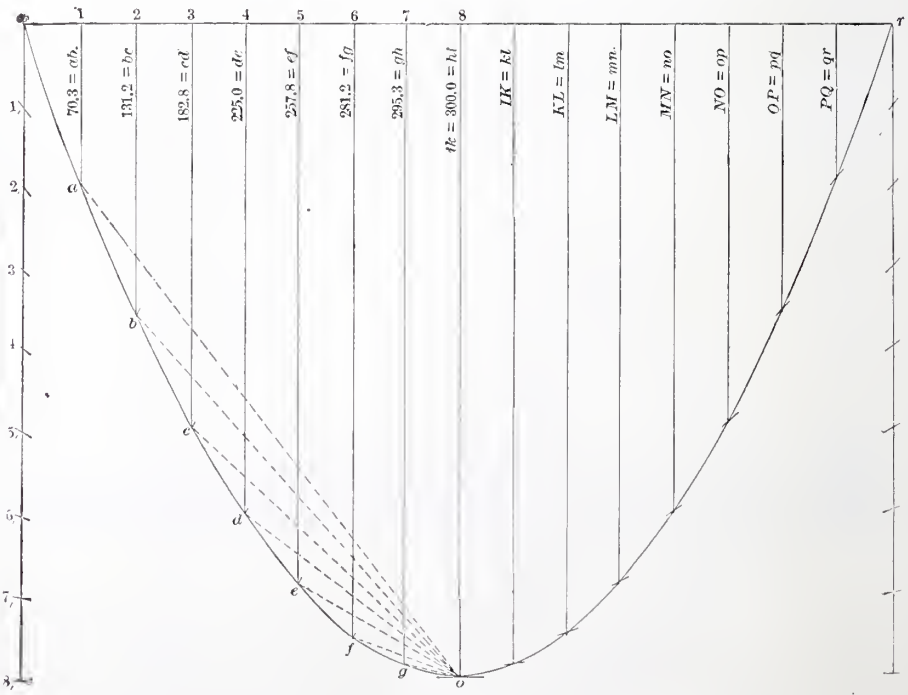

0 1 2 3 4 5 6 7 8 r
70.3 = ab. 131.2 = bc 182.8 = cd 225.0 = de 257.8 = ef 281.2 = fg 295.3 = gh de = 300.0 = hl IK = kl KL = lm LM = mn MN = no NO = op OP = pq PQ = qr
1 2 3 4 5 6 7 8
a b c d e f g o

*Fig. 2.—Diagran of Chord Strains in Truss Shown Above.*

Having thus determined the chord strains, our next step will be to find the strains in the web members of the truss—*i. e.*, in the diagonals and in the verticals.

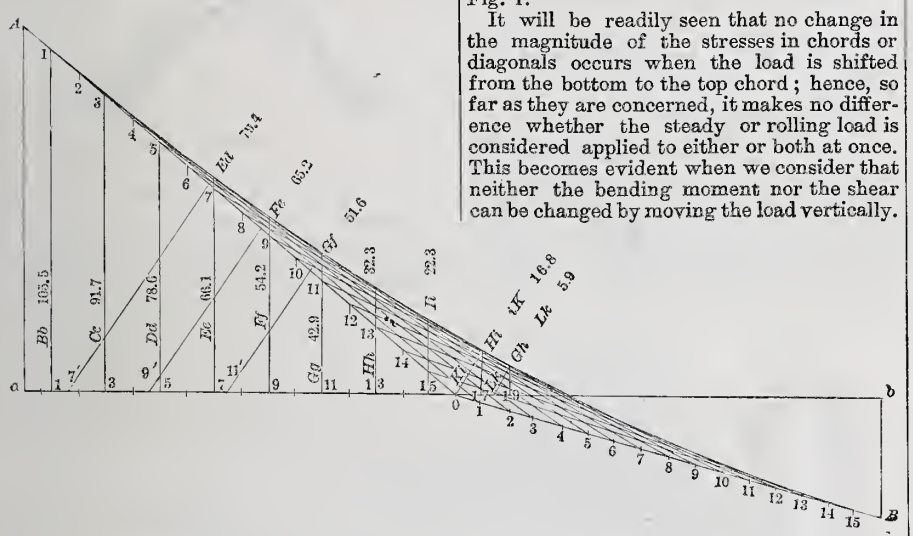
Remember, again, that these members resist shearing strains only, and that, therefore, we shall have to find the curve for maximum shears. It is evident that the greatest value of the reaction at either abutment will be equal to one-half the weight

of the truss and full load, and that the least value will be one-half the weight of the empty or unloaded truss—that is, in the truss under consideration :

$$\frac{w + w^1}{2} = \frac{75 + 150}{2} = 112.5 \text{ tons for maximum shear, and}$$

$$\frac{w}{2} = \frac{75}{2} = 37.5 \text{ tons for minimum shear.}$$

To find, therefore, the shear diagram, draw the horizontal line *a b*, Fig. 3, equal to the span of the truss, here equal to 200 feet. At *a* erect the perpendicular *a* A, equal 112.5 tons by the strain scale (30 tons equal to 1 inch), and from *b* drop the perpendicular *b* B opposite in direction and equal to 37.5 tons by the same scale. Bisect the line *a b* at O, and draw the lines A O and B O. Divide A O and B O each into the same number of equal parts as there are panels in the whole truss. Number the points of division in the same direction on each, beginning at A and O with zero. Draw straight lines 1–1, 2–2, 3–3 .... between the points having the same numbers. If now the whole line *a b* is divided into 16 parts corresponding to the panel points in the truss, Fig. 1, it will be found that the consecutive lines 1–1 and 2–2, 2–2 and 3–3, &c., intersect in the middle of the panels, and the vertical distance of these points of intersection from




*Strains in a Howe Truss.—Fig. 3.—Diagram of Shearing Strains in Truss Shown in Fig. 1.*

the line *a b* will give the exact shears in the panels in which they occur. Our readers will do well to plot this shear diagram on a large scale and carefully note the intersections of the lines. Scaling off now these verticals, and tabulating the results, we obtain for the strains in the vertical tie rods :

| Strain diagram. Fig. 3. | Strains in tons. | Tension in members. Fig. 1. |
|---|---|---|
| Vertical... 1 — 1 | 105 5 | B *b* and Q *q* |
| " ... 3 — 3 | 91.7 | C *c* and P *p* |
| " ... 5 — 5 | 78.6 | D *d* and O *o* |
| " ... 7 — 7 | 66 1 | E *e* and N *n* |
| " ... 9 — 0 | 54.2 | F *f* and M *m* |
| " ... 11 — 11 | 42.9 | G *g* and L *l* |
| " ... 13 — 13 | 32.3 | H *h* and K *k* |
| " ... 15 — 15 | 22.3 | I *i* |

In the truss under consideration the load is supposed to be on the lower chord. If it were on the upper chord, the end post *A a*, Fig. 1, would then have to carry one-half the total weight of truss and rolling load, or an amount of load expressed by the vertical *a A* in Fig 3.

To obtain now the strains in the diagonals, all that is necessary is to draw from the upper points of the verticals 1–1, 3–3, 5–5, &c., Fig. 3, lines parallel to B *a*, C *b*, D *c*, &c., till they intersect with the horizontal *a, b*. So as not to render the diagram confused, only a few of these lines have been drawn in Fig. 3 for illustration—namely, 7–7′, 9–9′ and 11–11′. If the diagram were completed we should then obtain for the strains in the braces :

| Strain diagram, Fig. 3. | Strain in tons. | Compression in members. Fig. 1. |
|---|---|---|
| Diagonal.. 1 — 1′ | 126.7 | B *a* and Q *r* |
| " .. 3 — 3′ | 110.2 | C *b* and P *g* |
| " .. 5 — 5′ | 94.5 | D *c* and O *p* |
| " .. 7 — 7′ | 79.4 | E *d* and N *o* |
| " .. 9 — 9′ | 65.2 | F *e* and M *n* |
| " .. 11 — 11′ | 51.6 | G *f* and L *m* |
| " .. 13 — 13′ | 38.9 | H *g* and K *l* |
| " .. 15 — 15′ | 26.8 | I *h* and I *k* |
| " .. 17 — 17′ | 16.8 | H *i* and K *i* |
| " .. 19 — 19′ | 5 9 | G *h* and L *k* |

It will be seen that the next diagonal would fall below the horizontal—in other words, its value would become negative or minus ; hence G *h*, H *i*, K *i* and L *k* are the only counter braces needed in this case, although it is usual to carry light counter braces beyond this point, and mostly through all the panels of the truss. As will be observed, there are no strains in this truss in A B, A *a*—or, in other words, the end posts and end pieces of the top chord have no truss stresses, but are useful in connecting the top lateral bracing by a stiff frame with the abutment. As generally constructed, the joints B and Q have not sufficient rigidity for this purpose, so that a pier or abutment panel is introduced. Some bridge-builders, however, make a special connection at B and Q, and carry the top chord no further. The truss then ends as shown on the right in Fig. 1.

It will be readily seen that no change in the magnitude of the stresses in chords or diagonals occurs when the load is shifted from the bottom to the top chord ; hence, so far as they are concerned, it makes no difference whether the steady or rolling load is considered applied to either or both at once. This becomes evident when we consider that neither the bending moment nor the shear can be changed by moving the load vertically.

The stresses on the verticals, however, will be altered by such a change, as may be seen by remembering that the vertical and diagonal, which together connect two adjacent weights, transmit the same amount of vertical force—or, in other words, the vertical strain in any tie is the same in amount as that in the strut, to the upper end of which it is attached.

The dimensioning of the different parts of a truss in accordance with the strains to which they are subject under different conditions of load, and the working out of details, do not come within the scope of this article.

## Rendering Paper Transparent.

The use of benzine for rendering paper sufficiently transparent to use instead of tracing paper for making blue prints, has been mentioned at different times, yet the wide gain which this process has made does not seem to have been as well understood as it deserves. An engraving from a book can be copied with ease and certainty, and without doing the slightest damage to the book itself, by use of blue-process paper and benzine to saturate the leaf. Recently we have had opportunity to see a large number of prints which have been made in this way, and we examined with a good deal of interest the volumes from which they were taken, in order to decide whether any injury had been done the original. It was impossible to discover where the benzine had been used ; the book showed not the slightest trace. In many establishments, especially those whose drawings extend over a large period of time, there are many which are of great value, but which cannot, with any ordinary method of duplication, be placed beyond the reach of fire. Too extensive to be copied, they have to be left in their drawers subject to all the dangers of an ordinary drawing office. A vast number of these drawings might be copied and blue prints made from them direct ; it would only be necessary, in order to do this, to thoroughly saturate them with benzine before placing them in the printing frame ; the copy, of course, would not be quite as perfect as from a tracing, but the line could be seen and the drawing would have the additional security of copies in several places.

## Movable Houses.

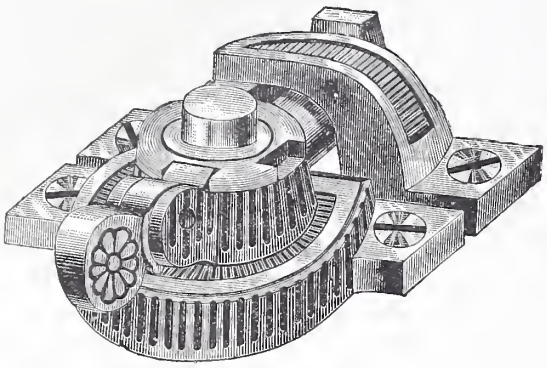
"Movable structures" says the *Lumberman's Gazette*, "or 'shakedowns,' as they are sometimes called—buildings for temporary occupation, which can be erected and taken down and removed at will—are becoming a very important article of manufacture. They have been constructed in every conceivable form, and of all sorts of material, but the demand for them was probably never greater than at present. Some Canadian firms have been doing an extensive business for some time in the manufacture of wooden structures which are intended as permanent buildings, but which retain the advantage of being easily removable whenever desirable, in a very short time, with comparatively a trifling amount of trouble and expense. The London (Ont.) *Advertiser*, in alluding to an establishment at Walkerton which engages quite extensively in the manufacture of these residences, says : 'At Messrs. Truax's planing mills orders for a whole row of houses can be filled in a few days, and it is not uncommon to see an entire street for Brandon, or a block for Winnipeg, sent out on a train 20 or 30 days after the order has been received. During the past season Messrs. Truax shipped 219 cars of knock-down house material to the Northwest.' These buildings were the result of necessity during the war, when they were first brought out for use by the sutlers of the army, and many a one has suffered demolition at the hands of soldiers because of the extortions and rascality of the owners. Their use in the army suggested their utility in the prairie country of the Northwest, where timber is scarce, and their practicability has become recognized to such an extent that the demand has become quite excessive. Notwithstanding their recognized utility and adaptability, the disadvantage of weight has overshadowed them, making them, comparatively speaking, quite expensive when they reach their destination. But as neeessity brought them to the surface, so in time will it bring their successor if it shall prove inadequate for all the demands, including cheapness, utility, inexpensive transportation, durability and comfort.

"We perceive that an officer in the German army has invented a new form of transportable dwellings, which seem to combine some of the qualities in which the wooden structures are lacking, especially lightness, and that other advantage of compactness when prepared for transportation, which are essential at least for bivouacs and the march. These new aspirants for popularity are made of felt, impregnated with substances which render them impervious to water. The idea is intended to apply specially to hospital tents and the large kind of such dwellings. In addition to being water-tight, these tents are cool in hot weather, and, to some extent, are able to moderate a severely cold temperature. They can be packed into a few comparatively small boxes, and ventilation is duly provided for. They resist hurricanes better than linen tents. Their erection and removal is very simple, and their cost is said to be small in comparison with that of linen tents. If they shall possess all the qualities which are claimed for them, the days of the wooden 'shake-down' may be set down as numbered, as soon as the merits of the new felt houses become fully understood."

## NOVELTIES.

### Gravity Sash Lock.

A new form of gravity sash lock is now being put upon the market by the Kempshall Mfg. Company, of New Britain, Conn. The general features of this fastener are clearly



*Novelties.—Fig. 1.—New Gravity Sash Lock.*

shown in Fig. 1 of the engravings. To open the lock it is necessary to raise the pivoted latch shown to the left of the foreground in the engraving. When this has been lifted the lock turns in the usual manner. The latch engages in notches cut in the flange at the top of the post above the sweep, thus locking the fastener both when the window is secured and when the parts are turned out of place to permit raising and lowering of the sash. This sash lock consists of very few parts, is positive in its action, and, from the sample we have inspected, is excellently finished, and well calculated to meet the wants of the building trade for a satisfactory article of this kind.

### Wire Cloth for Lathing.

Various forms of metal have been used at different times as substitutes for wooden lath, among which may be mentioned wire-cloth, which has been extensively introduced. One of the chief claims of this material to favor is that by its use wooden buildings can be rendered practically fire-proof. Cast and wrought iron beams and columns in building construction, unless they are thoroughly protected from the action of fire, are not to be depended upon. A comparatively low heat renders them useless, and in many cases buildings are thrown down by the expansion of the metal and the sagging of heavily-loaded floors at a very early period after a fire breaks out. It is well known that firemen will refuse to enter an iron building for the purpose of fighting a fire, while they will contest the progress of the flames step by step in a building having wooden columns end floor beams. Since iron, to be entirely serviceable, must be incased in some non-conducting material, and since in many cases equally as satisfactory results are obtained from wood similarly protected, and withal at a much lower first cost, it follows that the use of wood in this general manner is becoming very common. One of the best protectors of wood is mortar, and, accordingly, some method by which the mortar can be held in place during the action of intense heat is a prime essential. Wire-cloth used as lathing has been demonstrated by repeated trials to be satisfactory for the purpose. The particulars of a test recently made under the supervision of Mr. O. B. Potter, of New York, on the site of the old *World* Building, may be of interest to our readers. A small building was erected, with walls of brick. It was covered with wooden beams, and common wood furring strips were run crosswise, to which was fastened the wire lath. Two coats of mortar were applied in the usual manner and allowed to dry. On the day appointed for the trial a very hot wood fire was kindled and kept to the highest point for two hours by frequent replenishing. The fire was then allowed to go down to facilitate investigation. It was found that the second coat of mortar, which had been artificially dried, had scaled off, but that the scratch coat was intact, not even a crack being visible. The original intention was to have ended the test at this point, but it was determined to proceed to a still severer trial. Accordingly, the fire was again built, and wood was supplied for 49 minutes longer, the fire burning on the second trial for an hour, making in all something over three hours, during which the ceiling was exposed to a more intense heat than would ordinarily be experienced in a burning building. At the end it was found that the plaster had fully protected the wooden beams, demonstrating that the employment of wire lath will serve to confine a fire to the apartment in which it originates. The manufacturers of the material thus tested, the Clinton Wire Cloth Company, of Clinton, Mass., with branch offices in New York, Boston and Chicago, hold patents for improvements which materially reduce cost. They put forward the statement that it only adds from one-tenth of 1 per cent. to 1 per cent. to the cost of a building in comparison with wood lath, while it materially reduces rates of insurance. The further claim is made for it that ceilings in which it is used will not crack, and that, therefore, it is specially adapted for fine work. We are informed that it is used in the buildings erected by the Astor and Stewart estates, and that it is employed in the Vanderbilt residences.

### Self-Clinching Staples.

Figs. 2 and 3 of the cuts represent one form of Frost's patent self-clinching staples, which are now being introduced by Stiles Frost, 276 Devonshire street, Boston. The peculiar feature of these staples is a series of notches or barbs made on the inside of the wire, the action of which is to force the staple open in the process of driving into the wood, causing the notches or barbs to adhere, as shown in Fig. 3 of the engravings, to a degree not possible to obtain with the ordinary smooth-shank staple. Three different shapes are manufactured, known respectively as the "long bevel," "medium bevel" and "short bevel." The only distinguishing difference between these three styles is the amount of spread which they obtain in the process of being driven home. The one that we illustrate is known as long bevel, and is calculated to spread the least. In the manufacturer's circular we find the following particulars: The staple clinches itself, and has many times the holding power of the staples of ordinary construction. It requires no boring for inserting, and never splits the wood, and it can be driven in all kinds of

*Fig. 2.—An Improved Form of Staple.*

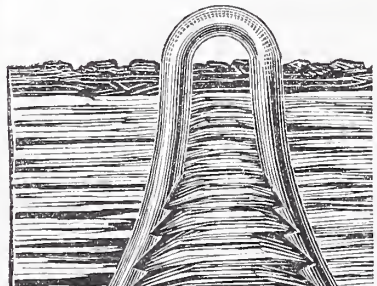


*Fig. 3.—Sectional View of Staple Driven into a Piece of Wood, Showing the Tendency to Spread.*

wood. The staple enters the wood at an angle on the outside, presses the wood down on the inner side, which enters the notch, as shown in the cut, and prevents withdrawal. The relative strength of these staples is so great that only one is required where two or more would be used of the ordinary kind.

Professor Lanza, of the Massachusetts Institute of Technology, made some tests of these staples some time since, obtaining the following results: A specimen staple made of No. 7 wire, 2¼ inches long, was drawn out from a block of wood under a load of 1175 pounds. A second specimen, made of No. 9 wire, 1¾ inches long, was drawn out under a load of 810 pounds. These facts show the utility of the staples, and should be sufficient to commend them for general use.

### Porch Post Supports.

The numerous examples of decay seen at the base of porch posts suggests the use of iron supports, both on account of durability of the parts and for hygienic reasons. Irons

*Fig. 4.—Form of Porch Post Iron, with Forked Foot.*

are frequently employed in these places, the source of supply ordinarily being the local foundry or blacksmith shop. An improvement over the irons commonly used embodies some convenient means of adjustment, thus making it possible to suit varying conditions and to line up old work after it has sagged. Different varieties of irons embracing these features are being manufactured by the Mount Joy Gray Iron Casting Company, of Mount Joy, Pa., and two styles are illustrated in Figs. 4 and 5 of the engravings. The first shows a forked foot, with screw holes, which occupies the least possible space on the porch floor, while the second has a flat base, more

*Fig. 5.—Porch Post Iron, with Flat Base.*

suitable for use upon stone piers and in similar positions. In both the weight of the post rests upon a broad flange forming part of the adjusting nut.

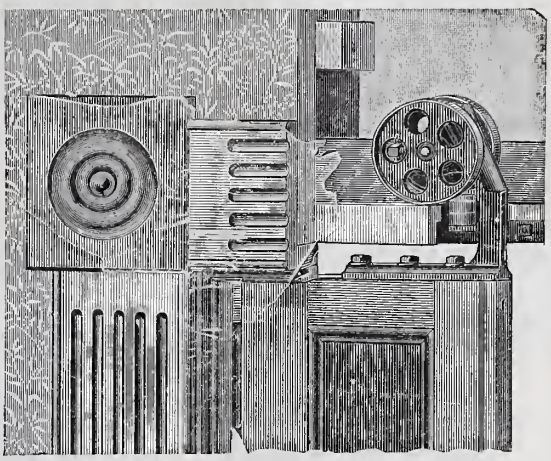
### Wrought-Steel Sinks.

A new article which possesses several qualities recommending it to the attention of builders and architects is a wrought-steel sink, made by the Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio. These sinks are stamped from steel plates, and are offered by the manufacturers as superior to cast-iron sinks on account of being lighter, stronger and more durable. The breakage of cast-iron sinks in shipping, storing, placing in position for use, and from various other causes, adds largely to the original cost, to say nothing about the great annoyance and delay caused by such accidents. Sinks made of wrought steel are free from these objections, and are warranted not to break from heat, cold or other causes. They are furnished painted or galvanized, as desired. The desirability of such an article

as here described will be appreciated by builders who desire good finish in all parts of the buildings under their control.

### Davis's Parlor Door Hanger.

The Seneca Manufacturing Company, Seneca Falls, N. Y., are putting on the market a new door hanger, known to the trade as the Davis parlor-door hanger, a view of the application of which is presented in Fig. 6 of the engravings. The valuable features, as set forth by the manufacturers, are as follows: Ease of hanging and attaching to the door. The services of an expert are not necessary in order to have it properly put on. No cutting or defacing of the door in hanging is necessary. The manufacturers claim that this is the only hanger which can be attached without cutting the door in any respect. A further advantage pointed out is the perfect adjustment attained in this hanger. By simply turning an adjusting screw in the front edge of the hanger, the door may be hung higher or lower, as circumstances require. The device is also easily adjusted sideways for any unevenness of the track, thus preventing binding or hard running. The general features of the hanger are clearly shown in the engraving, and will be readily understood upon inspection.



*Novelties.—Fig. 6.—Davis's Parlor Door Hanger.*

### Imitation Stained Glass.

From the growing demand for color effects in house decorations and finish a large trade has sprung up in genuine and imitation stained glass. There are very few dwellings of the better class or store buildings in the large cities finished at the present time in which there is not more or less stained or colored glass employed. While the application of stained glass, up until a comparatively recent period, was confined almost exclusively to churches and other public edifices, at present a very large share of the trade in this article is in the furnishing of dwelling-houses, hotels, offices and the like. While genuine stained glass appeals to those of cultivated tastes, and its use is to be commended from an art standpoint, there are many places where the real article cannot be used, and where an imitation can be employed advantageously. Accordingly, the field for the sale of such material as may be used in imitation of stained glass is of considerable magnitude. Aside from purely æsthetic considerations, the employment of imitation stained glass in some situations is more desirable than that of the genuine material. Lead sash, which are used with genuine stained glass, while undoubtedly very artistic, are not always satisfactory from a utilitarian standpoint. A solid pane of glass is frequently a desideratum. Accordingly, the use of material producing an effect similar to that of stained glass, and free from the presence of objectionable features, finds many friends. Messrs. F. M. Johnson & Co., of the Domestic Building, New York City, are offering a material for imitating stained glass which has already come into very general use, and which, from the specimens we have examined both before application and after use, is well adapted to the purpose. It has the advantage of cheapness, ease of application and durability. It consists of a paper-like material, translucent in character, upon which are printed in colors the patterns and figures which it is desired to impart to the glass to be operated upon. The method of application is very simple, the essential being a perfectly clean glass, some pure water in which to soak the sheets, a bottle of cement specially prepared for the purpose, and, finally, the application of a coat of varnish after the work is finished. A very large variety of designs are available, while the utmost latitude is allowed to individual taste in the way of combinations and arrangements of figures. Among work recently finished of this kind we may mention a handsome window in the private room of the editor of the Buffalo *Express*, in the new building recently occupied by that paper, and some very elaborate specimens executed at Saratoga.

### Overhung Cutting-off Carriage Saw and Gaining Machine.

The combination in one machine of both a gainer and a cutting-off saw, constructed on improved principles and capable of quick and easy adjustment, is a new feature in wood-working machinery and one long desired by wood-workers. Such a machine is adapted to carpenters' and builders' use for rabbetting and dadoing door and window frames, and for various work of a similar character. A machine of this kind has recently been brought out by Messrs. C. B. Rogers & Co., of Norwich, Conn., and 109 Liberty street, New York, and is illustrated in Fig. 7 of the engravings. The cutter-head works over the top of the stuff, so that the operator is always working by his lines instead of under side, as in the old way. The machine is especially useful for cutting and squaring-up lumber for doors, sash, box and panel stuff to lengths; also for cabinet and picture-frame makers' use. The gateway carrying the arbor is adjustable up or down by means of a crank or screw, so that a saw can be used from 8 to 16 inches in diameter, according to the work to be done. A gaining-head or dado

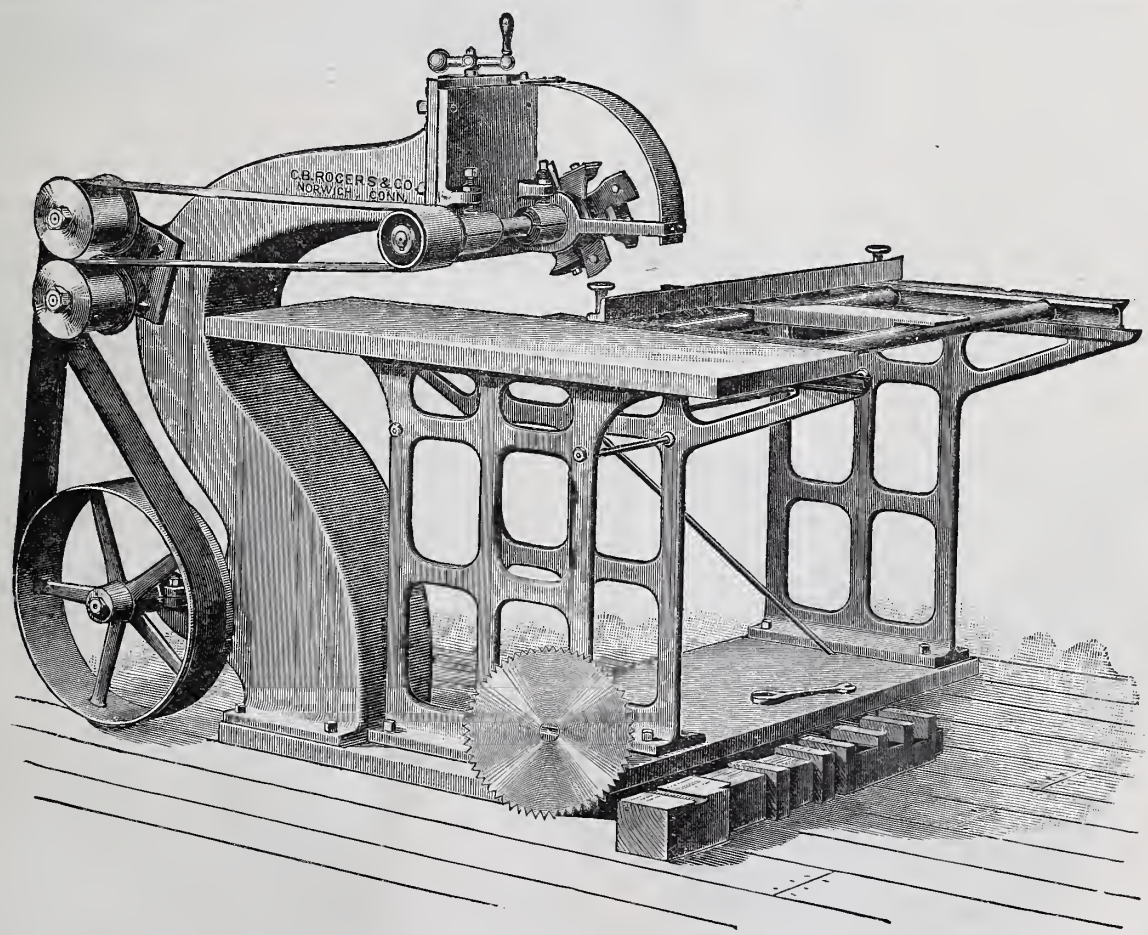



*Fig. 7.—New Overhung Cutting-Off Saw, Built by C. B. Rogers & Co., Norwich, Conn.*

can be put on in place of the saw, and gains from ⅛ to 2½ inches deep can be cut with an 8-inch head. This machine, the manufacturers assure us, is thoroughly built in all particulars, only the best material being used. It weighs about 1000 pounds. The size of mandrel is 1 inch. The power required to drive the machine is equivalent to about three horses.

### Universal Rip and Crosscut Saw.

In Fig. 8 of the engravings we show a new rip and crosscut saw, with planing, jointing and boring attachments, recently brought out by the Cordesman & Egan Company, of Cincinnati, Ohio. This machine has been designed for the use of carpenters and builders and makers of furniture, as well as miscellaneous woodworkers. Its special advantages are the facilities for performing a large variety of work combined in one machine. The makers claim for it that it will do the same work as other machines costing double the price. Every part has been made with a view to the convenience of the operator, and the different portions of the machine are so arranged that when two men are working on it at the same time, as is often required, they do not interfere with each other in the least. We understand that a number of these machines have already found their way into use, and that they have given general satisfaction. As may be seen by the engraving, the frame is cast in one piece. The table is large, extra heavy, and is so arranged as to be moved up and down like the bed of a planer. The sliding tables on each side of the planing head are adjustable, and the ends can be reversed and a 20-inch saw put on the mandrel. A hardwood board may take the place of the iron tables, so as to accommodate saws, heads or bits of odd sizes. With reference to the kind of work that may be done on this machine, the manufacturers offer it as a first-class rip saw in every sense of the word. It is also a first-class crosscut saw, and, having angles for cutting miters and bevels, can be used for a great variety of work. It may be used for splitting lumber up to 10 inches in width, or, by turning over, up to 18 or 20 inches in width, by using a 20-inch saw. The machine is also a groover, and panels can be raised any depth. It may be used for planing and joining up stuff 5 inches wide and taking it out of wind. In box factories and similar establishments the machine is a first-class hand matcher. By the aid of an extra fence it makes both tongue and groove without any change. As a horizontal boring machine, it is also successful, being provided with an independent adjustable table raised and lowered with a screw and wrench handle, as shown in the engraving, on the boring side. A man may work on this side of the machine and not interfere in any way with the operator on the other side. The mandrel is of heavy steel, the arbor boxes are self-oiling, are solid on the frame, and are lined with the best Babbitt metal. In addition to the range of work above mentioned, an attachment for tenoning with a solid table is put on when specially ordered.

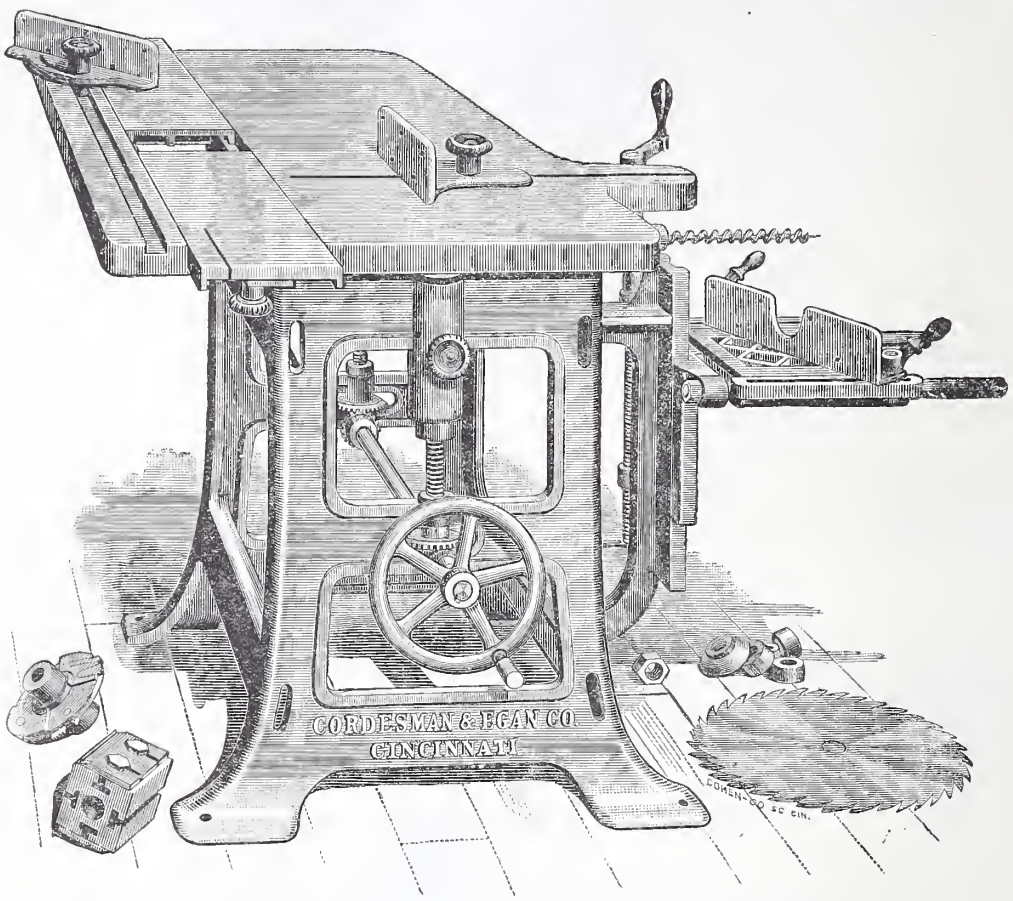



*Fig. 8.—New Crosscut Saw and Boring Machine, Built by Cordesman & Egan Co., Cincinnati.*

### New Roofing Tile.

The Garry Iron Roofing Company, of Cleveland, Ohio, have for some time been experimenting with a new roofing tile, and after a number of trials, in which the utility of the new idea has been satisfactorily demonstrated, they are now putting the article upon the market, and offering it to the attention of architects and builders. This tile, in some particulars, is not unlike others which have preceded it. It is a lozenge-shaped piece of metal, struck up in dies and finished with grooved edges for overlapping and making water-tight joints. The accompanying diagram, which shows the method of applying the tile to a roof, gives a fair idea of the nature of the article. Three points in each tile are prepared for receiving nails for holding in place, while the fourth point is arranged to hook against the tile immediately below it. The finish at the eaves and at the edge of the roof is indicated in the sketch. It is made by cutting the tile with a pair of tinners' shears, bending down against the edge of the roof board and nailing as indicated. This work any builder can readily perform without the assistance of a skilled workman.

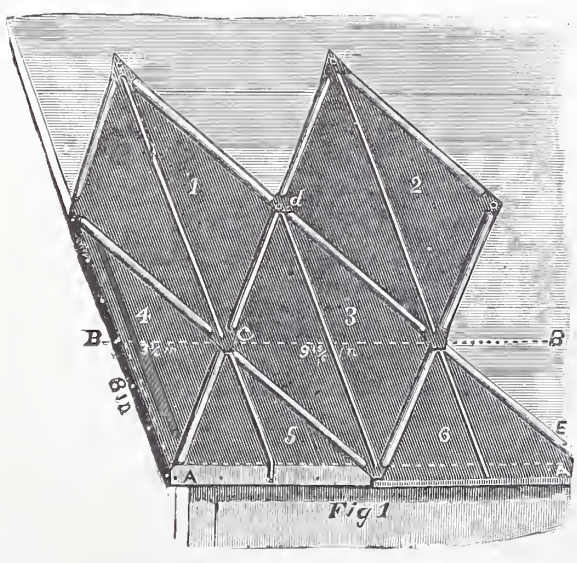



*Fig. 9.—New Metallic Roofing Tile.*

### Wood Water-Pipe.

Mr. A. Wyckoff, No. 122 Railroad avenue, Elmira, N. Y., is offering a water-pipe for public and domestic use made of wood and reinforced by iron. The advantages claimed for this pipe are that it is free from the objections common to most kinds of metallic pipe, cheap in its first cost and durable. In his patent round coated water-pipe, strengthened with iron, the iron is wound spirally around the wooden pipe from end to end. Accordingly, the pipe can be made to stand any required pressure. The joints are so constructed as to be made tight without lead or other cementing material. The manufacturer points out the further advantage that this pipe can be tapped and connected with branch pipes more easily than any other kind, that it is much lighter than any other metallic pipe, more easily handled, and that the cost of transportation is less than that of competing materials. Where coal and iron mines are to be drained, or where water which contains minerals is to be conveyed, this pipe is desirable from the fact that mineral water has no effect on the wood, while it would soon destroy metallic pipe. Several varieties of this pipe are made, some round and some square, and an asphaltum coating is used, which greatly increases its durability. The pipe is furnished in lengths of 6 to 8 feet, and of various diameters.

### Metallic Tile.

A new article for use in interior finish is announced by the Metallic Tile Company, of No. 97 Ohio street, Chicago. It consists of sheet-metal tile struck up in an ordinary stamping press, by which process almost any figure can be imparted to the pieces, and so applied to the walls of a building and reinforced by cement as to become an integral part of the structure. Various attempts have been made in the past to utilize sheet metal in the interior finish and decorations of buildings, but all such efforts have resulted in loss to their projectors and dissatisfaction to those employing the material. For the most part, the attempts to introduce interior sheet-metal finish in the past have emanated from the cornice men and those accustomed to the employment of zinc, copper and galvanized iron in exterior work, and a part of the failures that have occured have

been attributable to the lack of an appreciation of what is really required for inside finish, rather than to the inability of the persons engaged to produce the work or adapt the material to the conditions of use. The Metallic Tile Company approach the problem from a very different direction, and the fact that the promoters of the scheme have had long and successful experience in the manufacture and use of decorative metal work made by casting, and that they are assisted by eminent architectural talent, is some assurance that they appreciate the requirements of good interior work at the outset. We shall observe the success of their enterprise with great interest. The tile, when they leave the die, so far as the face is concerned, resemble tile of other material. From two opposite sides of the face, however, flanges ¼ inch in width are turned back at right angles, and on the other two sides similar flanges are turned ¾ inch in width, through which slots are cut. The surface to be covered with the tile—as, for example, a wainscot in a hall—is first covered in sections with plaster-of-paris to a depth of ¾ inch, and while the plaster is still soft the tile is pushed into it. The plaster "keys" through the slots in the wide flange above mentioned, while all the flanges serve to hold the tile in shape and give them proper bearings against each other. For caps, bases, architraves, &c., to be used with the tile, the company manufacture moldings by rolling and stamping which are similarly applied. Sheet brass is the metal which is employed. The advantages upon which the company lay special stress are indestructibility, simplicity, cheapness and cleanness. The weight of encaustic tile is avoided, and something incombustible is provided. The possibility of using special patterns at reasonable cost will recommend this style of finish to many architects, while the opportunity of varied color effects, obtained by electro-plating and other means, opens up a wide range of application. Although the enterprise is a new one, we are informed that several important contracts have already been obtained. We have examined specimens of the work and see in it great possibilities.

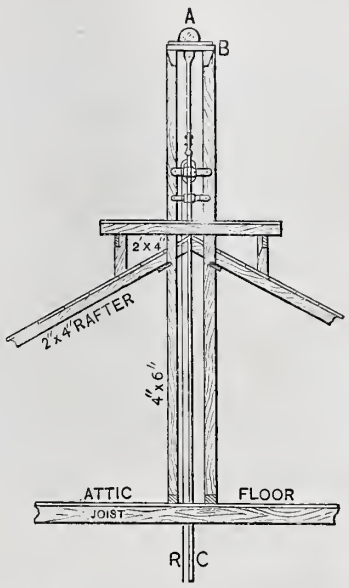
## Water Supply for Country Dwellings.

BY A COUNTRY PLUMBER.

### VI.

In this article one more illustration of framework for windmills is given, with which we will conclude that part of our subject. Figs. 1 and 2 show views of framework attached to the roof of a building serving as a tower. Two timbers 4 x 6 inch rest upon the attic or upper floor of the building, pass vertically through the ridge of the roof, above which they rise about 6 feet. A simple framework is constructed about them to support a platform 6 feet square on top of the roof. A is the crank shaft of mill; B, the bed-plate; C, connection to pump; R, shut-off rod; T in the side view is the tank; O, overflow pipe, and D, the discharge or conveying pipe from the pump. Fig. 3 shows a convenient manner of arranging a pump in a pit, when the mill is erected on a building and the water is not directly beneath it, but at some distance away, but not beyond drafting distance. The pump P is bolted to a plank secured to lower floor and in pit. L is connection to windmill. I is a bracket-brake for hand pumping, attached to the same plank. S is the supply or section pipe running to well or spring provided with vacuum chamber G. D is the discharge or conveying pipe reaching to the tank. F, air-chamber on same. U, U, unions on pipes to allow of pump being disconnected in case of needed repairs. X, check-valve in conveying pipe. E is a three-way cock with handle H, reaching above the floor, for drawing water through crook K, which is provided with hose threads. The three-way cock may be so arranged that water may be drawn from the tank, or only as it is discharged by the pump. The pit should be of sufficient depth to protect the pump and pipes from freezing in the coldest weather, and should be provided with close cover and a movable hatch or trap door. A small hole should be drilled in the pipe connecting crook K, to empty it and prevent its freezing. Pipe D, running to tank and overflow pipe O in tank, should have coverings to prevent freezing.

No arrangement for stopping the mill when the tank is full is shown. If such is desired it can readily be arranged by connecting a float to a lever attached to top of tank,




*Water Supply for Country Dwellings.—Fig. 1.—End View of Roof Framing Supporting a Windmill.*

the shut-off rod being connected to the opposite end. This arrangement was shown in a former article in connection with tower with elevated tank. In some situations such an arrangement would not only prove practical, but also economical, saving the expense of a tower for the mill and tank-house. The building would necessarily have to be located where there was a good exposure to wind. If upon a barn or stable, a geared mill could be made serviceable for purposes mentioned in our last article, as well as for pumping. Again, it would need to be within drafting distance of the water when the well or spring was at its lowest stage. When pumps are placed in wells, it is inexcusable to

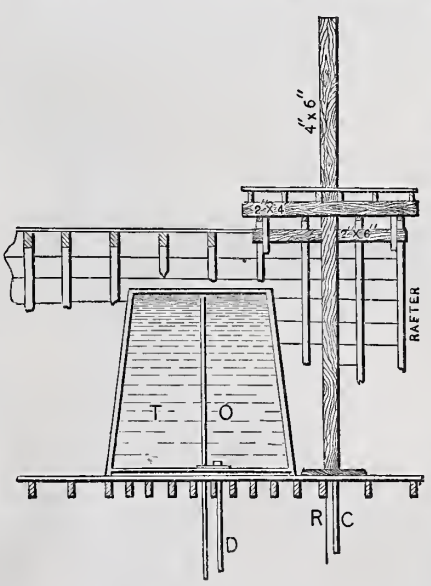



*Fig. 2.—Side View of Same Framing, Showing Tank in Garret.*

place the cylinder as far above the water as 20 to 25 feet. But when seeking a location for a mill and pump, if we can save the expense of a separate structure for it by placing it upon a building already erected, we are justified in locating a pump as far above low-water line as is consistent with practical results and necessity. We should in all such instances provide a larger suction pipe and never omit the vacuum chamber and a foot valve, especially if the pipe is long. It should also be borne in mind that small pipes increase friction and consequent labor of pumping. That the mill may be able to operate the pump on the lightest wind, a free passage for the water should be given. Avoid unneccessary angles and provide pipes a size larger than the size of the pump would indicate. To illustrate: If the pump is 3 inches in diameter, 1½ inches for suction and 1¼ inches for discharge will be better and productive of better results than when 1¼ inches for suction and 1 inch for discharge pipes are used. Customers frequently insist that the pipes are unneccessarily large, because they desire to reduce cost and do not understand the necessity of using certain sizes, and not infrequently the mechanic is obliged to use smaller sizes to bring the cost within the limit of a customer's ability.

The kind of pipe to use, whether lead or iron, or, if iron, whether plain, galvanized, enameled or asphaltum coated, is much harder to determine. The writer, after having used all the above mentioned, is still

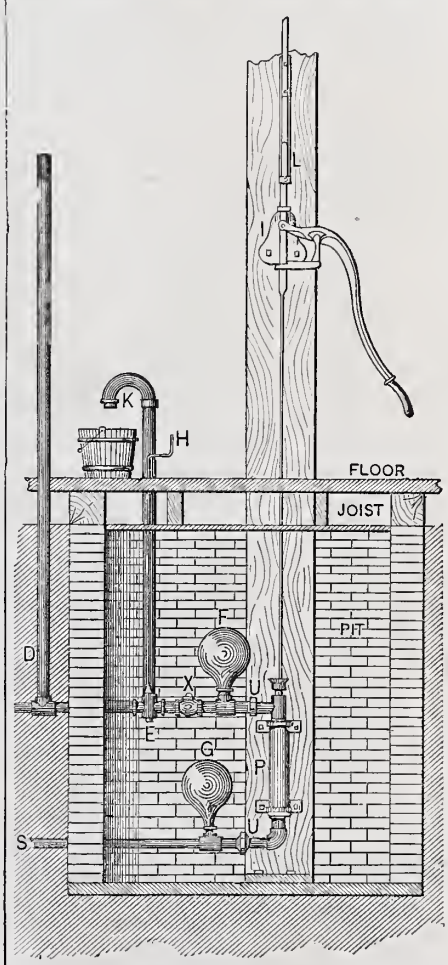



*Fig. 3.—Method of Arranging the Pump in a Pit when a Windmill is Erected on a Building.*

in doubt as to which are actually the best. A cheap, durable and positively safe pipe, that imparts no disagreeable taste to water conveyed in it, would be a great boon to the country workman. A customer who had about 2000 feet of ashphaltum coated iron pipe placed in a job a year ago, now says: "I am very much pleased with asphaltum pipe. The water comes perfectly clean, and there is no taste of the asphaltum. There was some taste at first, but it seems to be all gone." As this gentleman is very intelligent and a close observer, I regard his testimony as of value. Coating or dipping in asphaltum increases the cost of iron pipe but a trifle, and if it proves durable as a protector, will solve this vexed question. Lateral conveying and suction pipes should be placed below the reach of frost in winter and excessive heat in summer; the trenches filled in such manner that the earth will not be carried away by rains, leaving the pipes exposed.

## CORRESPONDENCE.

### Proportions of Cornices.

*From* P. E. C., *Wheeling, W. Va.*—Let me say a word with regard to cornice designs and projections, about which something has already appeared in the correspondence department. Some one suggested taking $\frac{1}{12}$ part of the hight of a building for the soffit or projection of the cornice. Architects, at least, can see the absurdity of this rule. It may work for low hights. Vitruvius allowed $\frac{1}{11}$ to $\frac{1}{12}$ of the whole hight of the building for entablature, which of itself regulates the projection in true architectural proportions. As a rule, that which will apply to public buildings or street fronts will not adapt itself to all styles of private residences. The judgment of the architect must necessarily be brought largely into play in treating different styles.

### Carrying Steam Long Distances.

*From* J. H., *Rockford, Ill.*—Will you be kind enough to tell me, through the columns of the paper, in regard to the best manner of conveying steam to a distance, and the size of pipes necessary to heat an office 25 feet square with 10 feet ceiling. The boiler is about 120 feet from the office. The pipes would have to be put under ground. How deep ought they to be, and how protected? The office building is framed, and stands on ground 6 feet higher than the boiler. The average pressure is 40 pounds. Will it be necessary to have a return?

*Scaffolding.—Fig.* 1. *—Hanging Gauge for Hinges of Outside Blinds.*

*Answer.*—The question our correspondent asks us is a somewhat difficult one. In regard to the depth under ground at which the pipes must be placed, it is not easy to say without knowing how deep the ground is likely to be frozen in the winter time. In materials to be used we have our choice between hair felt, asbestos boiler covering, mineral wool and several others. The question of cost would have something to do with the selection of the material, and the cost of coal or the cost of steam would have still more to do with it. If steam is cheap and of little consequence, the problem would be a comparatively easy one. If it is costly and desirable to save every pound so far as possible, of course it will pay better to invest in a greater amount of pipe covering, put on a greater thickness and bury the pipe deeper in the ground. For the live steam-pipe a 1-inch pipe will answer, and a ¾-inch for the return or drip. If no return pipe is used a 1¼-inch pipe will be needed. If our correspondent means to use exhaust steam for heating, the pipe ought to be 1¼-inch, with a ¾-inch return. If there is no return, a 1½-inch pipe would be needed.

### Intersection of Pediments with Main Rafter.

*From* E. H. H., *Hamilton, N. Y.*—In answer to the inquiry of H. E. S., Plainfield, N. J., asking how to determine where the ridge of the pediment will strike the main rafter, I would say it can be obtained by taking a draft of the main rafter and drawing a line parallel with the base line of the draft, corresponding to the hight of the pediment rafter. Where this line crosses the line of the main rafter on the drawing is the point required. If the drawing is made less than full size, the hight may be measured by scale and transferred to the rafter. The point must be on a perpendicular line from the place taken from the center of the pediment.

### Hanging Scaffold.

*From* E. C. N., *St. Catherine, Ont.*—I have noticed questions in *Carpentry and Building* with reference to methods of building scaffolds, hanging stages and the like. I

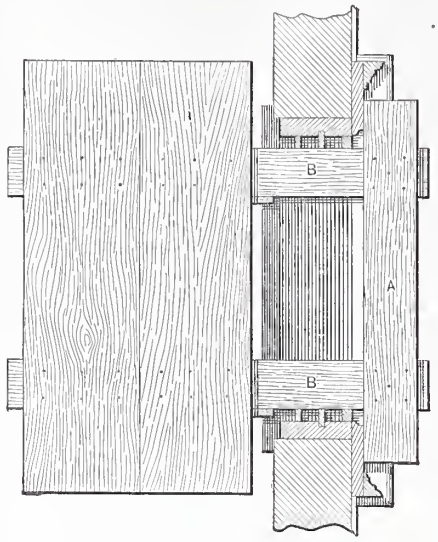



*Fig.* 2.—*Top View of Scaffold.*

inclose sketches of some work which has recently been done in that direction, and which I think will be readily understood by carpenters. The scaffold in question was made for hanging outside blinds on a brick house, and the design originated between my employer and myself. With its use we hung 42 pairs of blinds in 1¾ days. We were saved the use of a ladder. My employer worked outside and I inside of the building. Each was provided with a rod, as shown in Fig. 1 of the engravings. The parts marked A are pieces of tin fastened to the rod, provided with holes punched through them for marking the casings and blinds. With reference to the construction of the scaffold, the pieces B in Fig. 2 are gained out ½ inch, and into the space thus provided A is fastened. Both A and B are pieces 2 x 4 in size. The reason for the construction above mentioned is that the outside pressure has a tendency to tighten A against the inside casing, thereby holding it more securely. The space between the two pieces B is to be determined by the size of the window. The construction is such as to make the scaffold

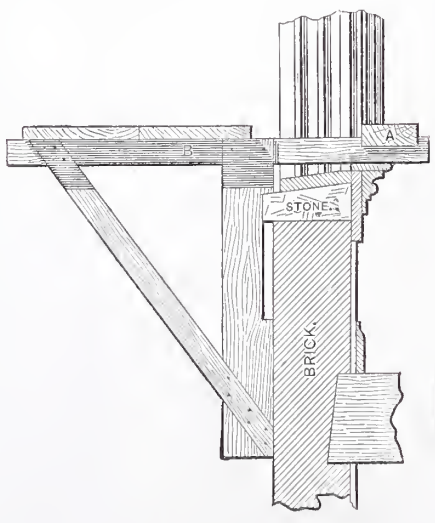


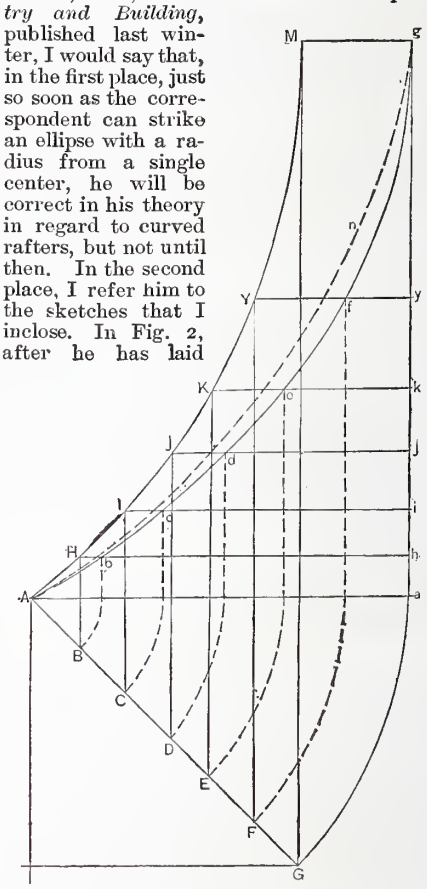

*Fig.* 3.—*Side View of Scaffold.*

self-binding. Fig. 3 shows the manner of tracing on the outside. The vertical piece was made 1 x 4 inches, and the brace of 1 x 2 inch stuff.

### Hip Rafters in Curved Roofs.

*From* G. H. H., *Hamilton, N. Y.*—I submit the following method of obtaining the curve of the hip rafters in a mansard roof, in response to the question of G. I. D., of Des Moines, Iowa. The correspondent is correct, so far as his extreme points for the major rafters are concerned, but he does not go far enough. There is no one point from which the curve for the major rafter can be struck. If the minor rafters were struck from one center—or, in other words, were of a regular curve—the major rafters will be of an irregular curve, or elleptical, as will be seen by the sketch submitted herewith. In this sketch, Fig. 1, the dotted curved line from A to *g* represents the correspondent's method, while the curved line between the two points following the intersections of lines at A *b c d e* and *f* with horizontal lines H I J K and Y, must be the exact position for the major rafter at each of these points. More points may be taken in the same manner, according to the requirement of the case. The major rafter can be taken in this manner from any shape that it may be desirable to employ in the minor rafters.

*From* E. J., *Detroit, Mich.*—In answer to the inquiry proposed by G. I. D., of Des Moines, Iowa, in one of the issues of *Carpentry and Building*, published last winter, I would say that, in the first place, just so soon as the correspondent can strike an ellipse with a radius from a single center, he will be correct in his theory in regard to curved rafters, but not until then. In the second place, I refer him to the sketches that I inclose. In Fig. 2, after he has laid




*Hip Rafters in Curved Roofs.—Fig.* 1.—*Diagram Accompanying Communication from G. H. H.*

down his common rafter, let him mark the seat of his hip rafter, draw in the ordinates, as shown by the dotted lines, and employ as many as seems desirable, the number being immaterial. Extend them downward until they cut the seat of the hip rafter. Square out from the seat, and make the different hights measured from it correspond with the lines from which they are derived. Then take a thin batton strip and bend it to suit the points thus established. Mark in around the batton. This will give the true shape of the hip rafter. Now lay off half the thickness of the hip rafter parallel with the seat, as shown, and where the ordinates cut it, square out, as shown by the dotted lines. Also square out with the ordinates in the hip. Draw in the short lines cutting the sweep and the dotted ordinate. This gives the required backing, as may be seen by the dotted sweep. In the third place, to more thoroughly understand why all this should be, let your correspondent take a piece of large cove molding, as shown in the second of my sketches. Let him cut one end square and one end a miter. Let him square down his ordinates as seen on the square sections. Carry the lines along the bottom of the piece, and square

them again across the miter section. When this has been done, let him see if it will fit a true circle. In conclusion, I may remark that when any circular body is cut on an angle the section ceases to be round and becomes elliptical. This is a fact well worth keeping in mind.

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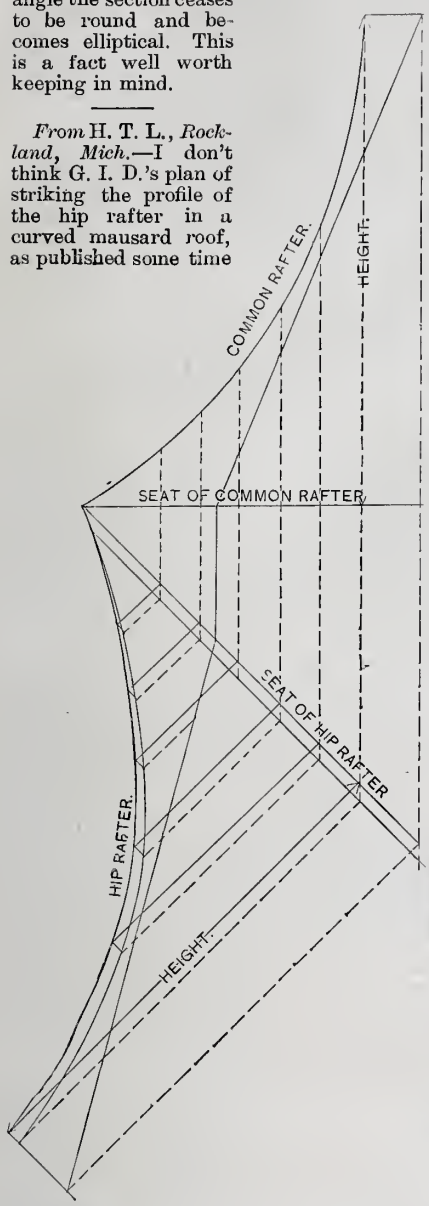
*From* H. T. L., *Rockland, Mich.*—I don't think G. I. D.'s plan of striking the profile of the hip rafter in a curved mausard roof, as published some time




*Hip Rafters in Curved Roofs.—Fig. 2.—Diagram Submitted by E. J.*

since in *Carpentry and Building*, will stand the test of practical work. His minor rafters are part of a circle, and therefore his major rafter must be a part of an ellipse, and consequently cannot be struck from one center. Referring to the inclosed sketch, Fig. 4, I offer the following plan: Draw A D equal to the run of the rafter. Let A J equal the rise of the rafter. Then A C or A E will equal the run of the hip or major rafter. Since F *a* is equal to the run of the minor rafter at that hight, then F *c* must be the run of the hip at the same hight. In like manner A *d* is the run of the hight H, and so on upward. After finding as many points in this manner as are desirable for the purpose, draw through them the curved line J E, which is the line of the hip roof. This general method will work with rafters of any shape or curve whatever. If any one cares to know, I will send my plan of laying out patterns in boards from planes.

*Note.*—We should be very glad to have this correspondent's explanation of his methods of laying out patterns, working size from plans, and we trust he will favor us with it for publication.

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### Bulging Walls.

*From* W. S. W., *Windsor, Mo.*—I desire to lay some facts before the readers of *Carpentry and Building* and ask for an opinion. I am engaged on a brick storehouse at present, which is 22 feet wide and 80 feet deep, two stories high. The first story is 13 feet and the second story 10 feet. The contractors for the brickwork say that the foundations rest on solid rock. During the time of construction the building has settled, and the walls are out of perpendicular about 4½ inches. The bricklayers, who are also the contractors of the building, assert that the cause is on account of the carpenter not bracing the building when he put up the upper joists. The building is not yet completed, but has just received the ceiling joists. It has stood for about three weeks since they were put on. At present the wall of the second story is being taken down on one side about half-way to the first-story joists—that is, the bricklayers are taking down some of the wall on one side, and believe that they can spring the other wall back. Now, what I want to ask is, Will it make a good job when it is done? Is it customary to put braces in joists to keep brick walls from springing when they are put up? I have worked at the trade for about 10 years, and have worked on numerous buildings four stories high, and yet have never seen braces used in the manner described. Perhaps some of the readers of *Carpentry and Building* can throw light an this question.

*Note.*—We shall be glad to have our practical readers answer this correspondent. There are one or two omissions, however, in his description of the building, which may prevent his receiving satisfactory responses. He does not indicate the thickness of the walls, nor does he assert for a fact what the foundations rest upon. The statement that the contractors represent that the building rests on solid rock, and the further statement that the walls have settled, indicate a discrepancy somewhere. We should suppose that if it were clearly proven that the walls had settled it would indicate that the fault was not necessarily in the way the joists were put in. With reference to bracing walls during the process of constructing buildings, practice differs in various parts of the country. In the poor construction frequently allowed in large cities at the hands of greedy contractors, expedients of this kind for keeping the walls in place are sometimes resorted to, which would never be thought of in towns where honest construction is the rule. Such bracing is almost always made necessary by the employment of walls too thin to stand alone. We should be glad to have our readers discuss this question according to its merits.

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### Foundry Roofs.

*From* R. J., *Waynesburgh, Ohio.*—Will you tell us, through *Carpentry and Building*, what you consider the best roof for a foundry? Is an ordinary tin roof, painted on both sides, a good one for this purpose, or is it affected detrimentally by the steam incident to foundries? Would like to know the experience of some of your readers?

*Answer.* — The usual foundry roof is the tar and gravel covering. Tin is not much used, if at all, and would probably be short-lived. Probably the best roof we ever saw on a foundry was one laid with pitch enough to throw off snow, and covered with what is called flat slate. In the roof in question each slate exposes its full face to the weather, and is laid in a cement. The cement was the invention of Mr. C. C. Post, of Burlington, Vt. It consists of coal tar (the liquid and not the solid article), thickened with cement, slaked lime and linseed oil. The proportions were made according to the judgment and the requirements of the material. It was heated until liquid, poured on the roof and the slate bedded in it. The joints were then payed, and the roof was finished. The main bulk of the compound is tar and cement, or tar and ground slate. When of just the right thickness, the compound sticks with extreme tenacity to the slate, and cannot be detached without violence. The cost of such a roof is, we believe, at the present time less than that of tin, and, on account of the greater surface exposed to the weather, is considerably cheaper than slate. A patent has been taken out for it. These roofs seem so entirely adapted to foundry buildings that we venture to suggest them for the considera-

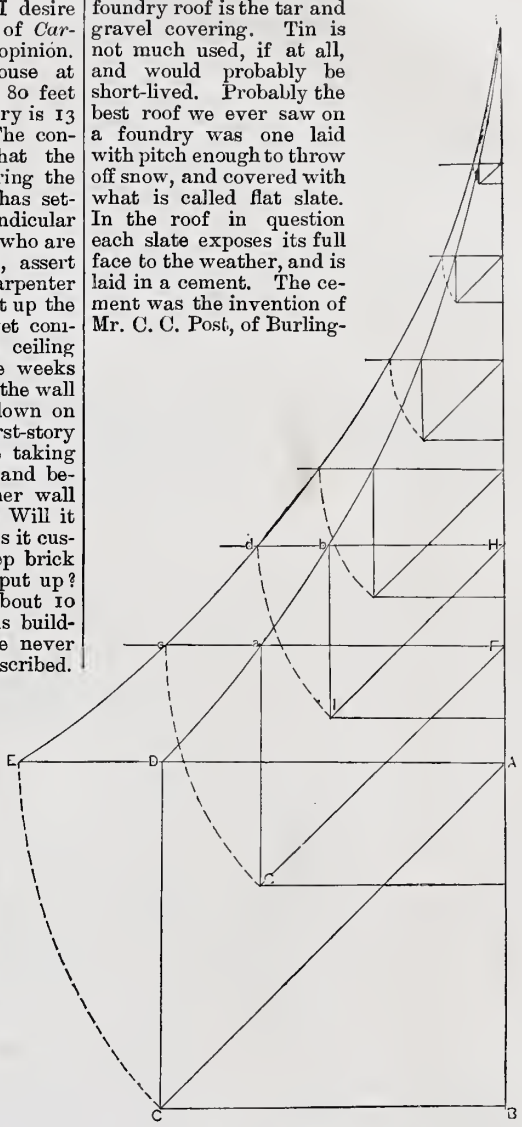



*Fig. 4.—Diagram with Communication from H. T. L.*

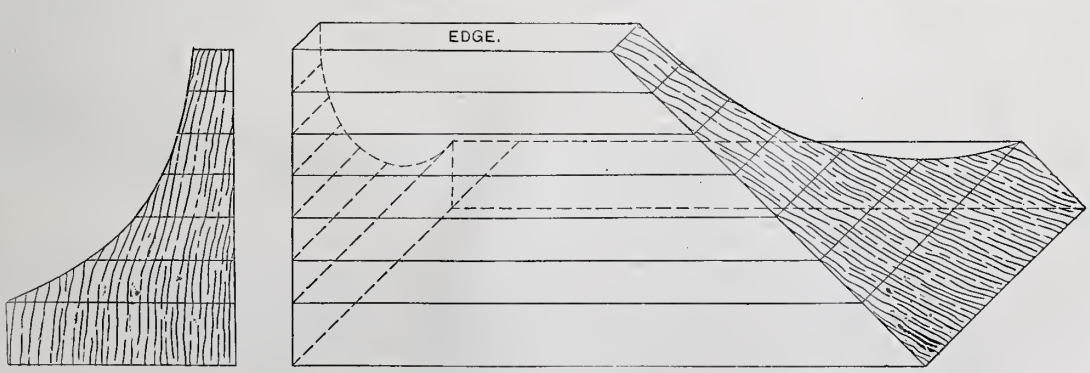
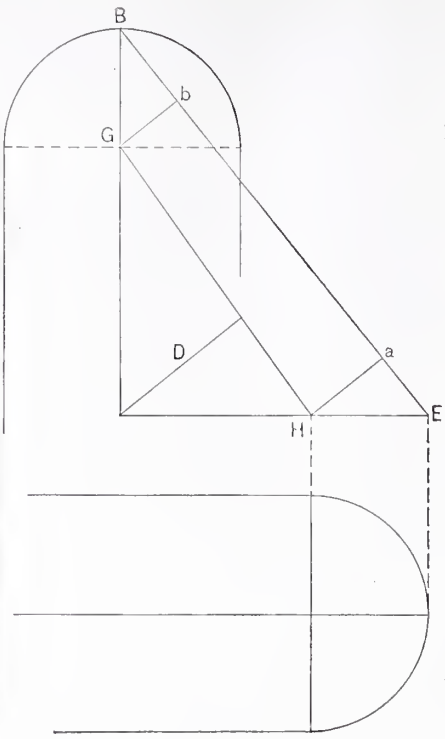



*Fig. 3.—Sketch of a Cove Molding Cut to Illustrate the Foregoing.*

tion of our readers having experience in such matters. They certainly deserve attention from practical men.

### Awning for Circle-Headed Windows.

*From* H. K., *Denver, Col.*—With reference to the problem of describing the shape of an awning for a circle-headed window, published in a recent issue, I would say that the question must be treated somewhat differently from that given in the answer there published. The problem presents an inclined cylinder whose rectangular cut, *a b*, of the accompanying sketches, is a part of an ellipse. The cylinder is somewhat flattened; more flattened at the top than at the bottom, because the rise is greater than the run, and the horizontal plane must form a circle equal to the circle of the vertical plane or head of window, and in order to make the awning draw up well. Referring to the method of describing the pattern under these conditions, the elliptical form of the cylinder must be found in two places, G and H, neither of which is parallel to B E, before the curved part of the pattern can be laid out properly. The method by which this is done is so clearly shown in the accompanying drawings that explanation is not necessary.




*Awning for Circle-Headed Window.—Fig. 1.—The Problem Stated.*

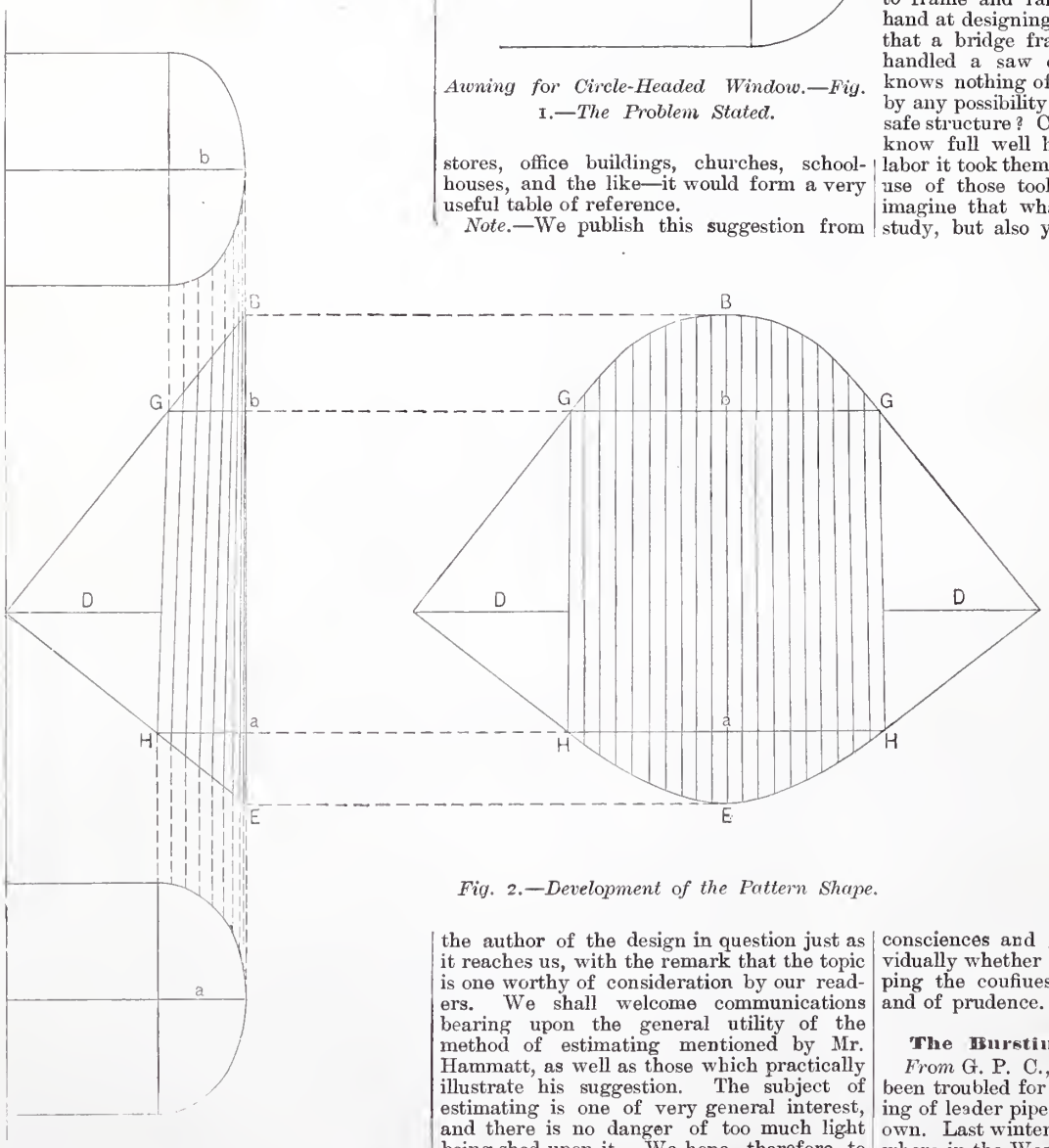



*Fig. 2.—Development of the Pattern Shape.*

### Cubic Contents.

*From* E. S. H., *Davenport, Iowa.*—Permit me to suggest that if some reader of *Carpentry and Building* will calculate the cubic contents of the eight-room house published in the July number of 1882, and on which several estimates of cost have been published in detail, and divide the cost by the cubic contents, thus determining the cost per cubic foot, a benefit will be conferred upon the trade at large. This would give a quick method of determining the cost of all similar houses. Some such quick plan is very desirable, especially to architects, in making first approximate estimates. If some reader of *Carpentry and Building* would carry out this suggestion and make a calculation of different classes of buildings—brick dwellings, stores, office buildings, churches, schoolhouses, and the like—it would form a very useful table of reference.

*Note.*—We publish this suggestion from the author of the design in question just as it reaches us, with the remark that the topic is one worthy of consideration by our readers. We shall welcome communications bearing upon the general utility of the method of estimating mentioned by Mr. Hammatt, as well as those which practically illustrate his suggestion. The subject of estimating is one of very general interest, and there is no danger of too much light being shed upon it. We hope, therefore, to have numerous communications called out by this suggestion.

### Designing Bridges.

*From* W. B. H., *Quincy, Ill.*—The May number of 1882 of *Carpentry and Building* contains a method of calculating and finding the dimensions of a Howe truss, given by a correspondent who signs himself F. F. As I am about to design a Howe truss, I should like to know if F. F.'s method is a safe one to follow.

*Answer.*—In compliance with the requests of several of our readers, we give elsewhere a clear illustration of the graphic method for finding the strains in a Howe or any other quadrangular truss, and take this opportunity to say to W. B. H. that F. F.'s method, referred to in the above letter, is probably safe enough for F. F. to follow; but its adoption might prove a rather dangerous experiment in the hands of one who, according to his own showing, has not even sufficient knowledge to judge of either the value or the correctness of a controversial communication on the subject made to a newspaper. F. F. is a practical bridge-builder, and his many years' experience would undoubtedly assist him very greatly in supplementing the deficiencies of his communication in the May number of 1882 in *Carpentry and Building*, which, moreover, was never intended by him to serve as a complete instructor in the art of bridge designing. Bridge-building, in the present state of the art, has become a distinct branch of engineering, the competent designer of bridges occupying the highest and foremost rank in this branch of applied science—and deservedly so, because of the thorough scientific training and large practical experience required for the intelligent performance of his duties.

It is surely a strange infatuation which impels intelligent men, perfectly competent to frame and raise a bridge, to try their hand at designing bridges. Do they believe that a bridge framed by a man who never handled a saw or an ax, and therefore knows nothing of the use of the tools, could by any possibility turn out to be a good and safe structure? Certainly not. Because they know full well how many years of weary labor it took them to become proficient in the use of those tools. Why, then, will they imagine that what took not only years of study, but also years of practice in bridge-works, for the designer to acquire, can be conveyed to them within the scope of a newspaper article. We do not desire to say anything which might discourage any one of our readers, either from seeking for information through the columns of *Carpentry and Building* or in their endeavors to acquire useful knowledge, but we feel it our duty to to utter a solemn warning against the foolhardiness of designing structures (to the safety of which hundreds of human lives must be intrusted) without bringing proper training to the task. That this is frequently done, some of the terrible bridge disasters on record bear witness. However, we shall always be glad to furnish information on the subject to our readers, and leave it to their consciences and good sense to decide individually whether or not they are overstepping the confines of their own limitations and of prudence.

### The Bursting of Leader Pipes.

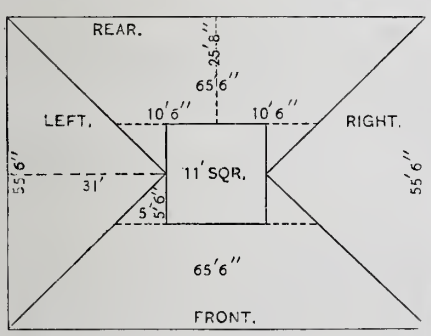
*From* G. P. C., *Lock Haven, Pa.*—I have been troubled for a long time with the bursting of leader pipes in several houses that I own. Last winter I tried a pipe, made somewhere in the West, if I mistake not, having a sort of projecting seam on the back, but which did not give me any special relief from the difficulty, owing to the fact that in many cases after freezing up the seam was opened so much that at the next time of freezing it burst easier than the ordinary round pipe. The tinman now desires me to put in a pipe—a sort of corrugated affair

—which he claims has the quality of being frozen without bursting, but as I am not a mechanic I cannot see how this can be so. As tinmen's bills are getting to be as bad as plumbers', I take the liberty of asking this question, which perhaps will draw out information that will be of value to other readers besides myself.

*Note.*—This correspondent's difficulty with bursting leader pipes is something very commonly met by householders in general. Answering his question as to how corrugated conductor pipes can be repeatedly frozen up without breaking, we would remind him that the shape of the pipe is such that a considerable amount of expansion is provided for before the metal is strained, and that the form is such that it would naturally return to its original shape—partially, at least—after the ice is removed. The best remedy for the annoyances of broken leader pipes, perhaps, is to place them where they will do the least damage in case an accident occurs. Sometimes connec ing a leader pipe with a sewer or underground drain will effectually prevent the formation of ice in the pipe. In other cases the pipe can be run on inside walls near chimney flues, in such a way as to keep them free from ice as long as there is any warmth in the chimney. The latter, however, is not a very satisfactory plan, from the fact that if a leak does occur the presence of the water is likely to do much more damage than if the pipe were placed on the exterior wall. Hanging a pipe on the exterior, where bursting, if it must burst, will do no damage to the building, is good construction in all cases. The entire question is one which practical men will find it profitable to discuss, and we refer it to our readers, hoping that communications on this subject will be forthcoming.

### Measurement of Roof Surfaces.

*From* A. P. S., *Plainview, Minn.*—I submit herewith my method of calculating the number of square feet in a roof of the character shown in Fig. 1 of my sketches.




*Measurement of Roof Surfaces.—Fig. 1.—Plan of Roof.*

Taking the dimensions given, I divide the rear section into two equal parts, and by adding them to the front section I have a plane surface 25 feet 8 inches by 86 feet 6 inches. The right and left sides I treat in the same manner, and obtain a plane surface 55 feet 6 inches by 31 feet. Taking the dimensions of the four triangular sections at the base of the cupola and combining them into one, I have a plane surface 10 feet by 5 feet 6 inches. This is a simple method, and I should suppose would commend itself to all who have roofs of this general form to calculate.

*Note.*—The annexed cuts are reproduced from the diagrams inclosed in A. P. S.'s letter, and, although not drawn to a scale, illustrate clearly his method. Fig. 1 shows a plan or top view of the roof, with dimensions and dotted lines showing how the roof is cut into parts so as to form the plane figures shown in Figs. 2, 3 and 4. The rear section, exclusive of the small triangles at the apex of the roof, having been cut on the dotted line through its center, that part of it to the left is transferred to the right-hand side of the front section, so that their oblique ends coincide, or so that the side marked 10 feet 6 inches will form a continuation of the longer side of the front section. In like manner the right half of the rear section is transferred to the left end of the front section, and the whole forms the rectangular surface shown in Fig. 2, with a total length of 86 feet 6 inches, and a width of 25 feet 8 inches, from which the entire area is obtained at a single operation.

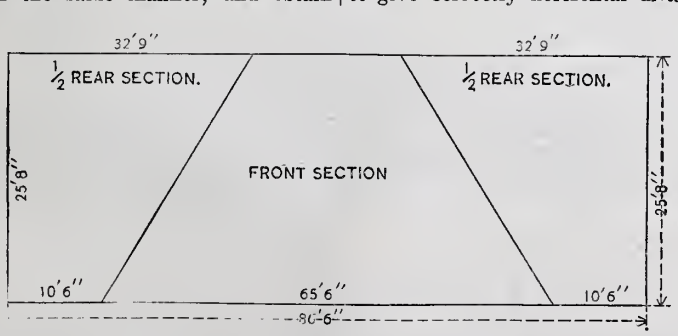



*Fig 2.—Combination of Front and Rear Sections into a Rectangle.*

The two halves of the left section are in like manner transposed and added to the opposite ends of the right section, forming the rectangle whose dimensions are given in Fig. 3.

Finally, the four right-angled triangles at the base of the cupola each have a base of 5 feet and an altitude of 5 feet 6 inches, and are set together, like the blocks of a puzzle, forming the rectangle, Fig. 4. While Fig. 1 is a top view, and is only supposed to give correctly horizontal distances, the dimensions 31 feet, 25 feet 8 inches and 5 feet 6 inches are the slant hights of the respective parts of the roof. We commend the whole operation as correct and somewhat ingenious, and as applicable to roofs composed of symmetrical parts.

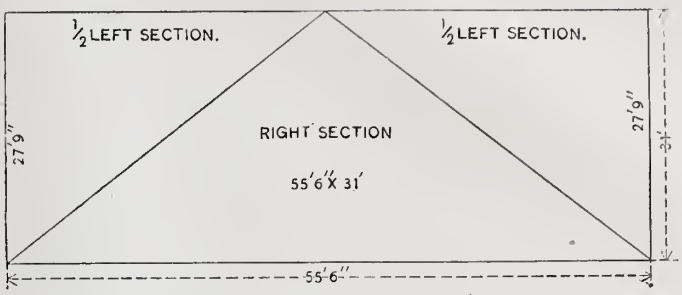



*Fig. 3.—Combination of Right and Left Sections into a Rectangle.*

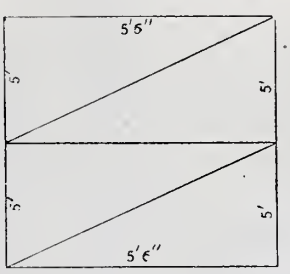



*Fig. 4.—Combination of the Four Small Triangles into a Rectangle.*

### Choice of Form in the Design of Buildings.

*From* E. G. AURAND, *Ossian, Iowa.*—In presenting reasons for preferring the plain and regular forms rather than irregular and complicated ones in the planning and designing of buildings, I believe we can discover one cause why architecture has failed to make that advancement in modern times that we see in engineering and other mechanical arts. It is customary for writers on art topics to refer us to nature as the great prototype of art, and the fountain, so to speak, from which the student is expected always to be refreshed. Authorities persuade us to view the human form as the acme of physical perfection, and poets sing of the image divine. Studying nature, we are taught, with possibly a few exceptions, that perfect economy in plan and structure characterizes all her works. In the human form we see that, by perfect economy of structure and the most direct methods known to our senses, a wondrous beauty has been attained. If the symmetry or harmony of proportion of the human form is disfigured in any way, by the loss of an arm, a leg, an eye or ear, how quickly do our sensibilities perceive this mutilation, this want of harmony and balance of parts. In agreement with the perfect symmetry of the human form is the perfect disposition of frame and muscle. Nothing is superfluous, nothing but has its office to perform, and in the most economic course. So, in man's constructive works, it seems to be conceded that economy in form, structure and material are more closely observed in civil and mechanical engineering than architecture. No deviation from the most direct forms and saving of material is made merely for effect. Yet no one with an eye to appreciate the fitness of form and adaptation of quantities to the ends desired will fail to see beauty in the rounded, gently swell-shaped connecting-rods of the steam engine, or the same swell-shaped columns used for support in engineering works.

Economy of material is here one of the primary objects sought, and the result is the beauty of adaptation—the same quality of beauty we ascribe to the human form. Perhaps the Greek understood this economic law of statics when he outlined his columns with that beautiful entasis, so universally admired. However, he has shown us the beauty of adaptation and fitness of forms. No novelty hunting would deceive the instinct of a true engineer to place the large end of a column upward, unless demanded by some special construction, or involving uncommon direction of strains. No doubt objectors will insist that a limitation to absolute simplicity and economy of form could only be productive of nakedness and monotony. Still, I am of the opinion that a thoughtful examination of the question of economy and simplicity of form in architectural design must lead us to acknowledge its superior advantages in achieving the largest measure of truth in our works; and we might be encouraged by the discovery that the qualities of the true in this case were the qualities of the beautiful. Modern authors on the theory of architecture usually agree as to the value of the qualities of beauty and expression in design, though not often pointing out in directness the way of its attainment. One of them says: "Beauty is ever associated with perfection, not ornament. The beauty of simplicity far exceeds the mock beauty of gaudy, showy ornamen-

tation. The beauty of simplicity never fails to call forth admiration." The same author, treating of buildings for family residence, refers to the practice of "breaking the ground plan in a complicated manner, and carrying up some parts higher than others to avoid flatness. It has a very specious appearance of effecting the object without unnecessary expense; but this is a great fallacy, as any one may see who makes a few calculations, that these breaks and jetties add more to the material requisite to inclose and cover a given space, and, in fact, are a greater sacrifice to architectural beauty than the largest features ever added to such buildings, supposing them added for ornament alone, which they never ought to be. When fashion, however, runs mad after some style devoid of prominent features (as the Tudor), there is no alternative but this extravagant broken-plan system, as the late Tudor revivers found to their cost." If the proposition is correct, that the most simple and direct forms are the most economical for the plans and general design of architectural work, and in a constructive sense more true, and hence more beautiful, the inference is justified that one cause for the superiority of mechanical and engineering works over the strictly architectural lies in the architect seeking for effect by irregular and overdrawn angularity of plans and outlines of buildings, often carried to the extreme by various projections of roofs and overhanging gables, in contrariety to plain, simple and direct forms which economy of structure and material truthfully demand. The injudicious use of ornament has probably done much to mar our architecture, but not more, I think, than the cause I have indicated. Many architects seem to be averse to regularity of plan. With a plain square or rectangular plan they will project a façade or gable on one side of the center, put in openings of different size, without regard to balance of solids with voids, apparently to do something *bizarre*, or something that has not been done before. All this may be picturesque, but does this quality deserve the attention it receives, or the major place it is assuming, in our domestic architecture of the present day? There are cases where the special requirements of the building to be erected, or irregularity of intended site, would necessitate a deviation from the direct forms; but, aside from imposed exceptions, I believe if two buildings, built side by side, of equal cubical quantities and quality of materials, one in the Queen Anne, or angular, craggy style prevalent, and the other a square, plain plan, encompassing the end by the most direct, economical and truthful methods, with an equal outlay of structural ornament, nine out of ten unprofessional persons would pronounce in favor of the latter. The intuitive nature of man will perceive truth and acknowledge it where it does not antagonize his selfishness.

I further believe that if we would, as a rule, employ only the simple and economic forms in structural design, we might hope to reach a national architecture. Anyway, we might succeed in having an honest and true architecture. Neither do I believe these simple forms would have a tendency to impoverish design or limit ornamentation. On the contrary, I think the expression of our architecture would be improved. Space will only permit two or three suggestions as to the manner of obtaining effect in simple design. Imagine a dwelling-house in the form of a cube, usually regarded the most objectionable form for a design with which the architect has to deal. Construct the roof in the best form to secure protection with economy of material. Let the eaves project far and wide, regardless of any classical ratio, but so as to make a deep, dark shade beneath. With the very suitable surface for ornament around doors and windows, there yet remains the plain exterior walls to decorate with carving or color; and in my judgment the simple cube, under the hand of a conscientious student of art, will express a truthful stability, symmetry and perfection of form never attained by plans with broken-up and irregular outlines. The architect who loves his art will try to speak through his work. While it is not probable that all who practice the master art would have opportunity to turn marble into "frezen music," or stamp History or Poesy on enduring stone, yet there is a wide domain in our country for improvement in the beauty and expression of architectural work. The medium, and even smaller, class of domestic buildings may, by economy and simplicity of form, be clothed in some degree with the expression of repose.

There is an inborn spirit in man, latent, if not active, ever in sympathy with the quality called repose. The chord of this spirit, or sensation, vibrates in man when touched by a harmonious external cause. In nature we see this quality all about us. The constancy and repose of the sky, the landscape and the everlasting hills impress us with this beautiful sensation continually. Through this prevailing quality in nature, and its effects upon mankind, perhaps lies the origin of the oft-repeated maxim that the highest result of good architectural design is repose. The extravagant and picturesque may surprise or confuse us. But that design and structure in building that follows the laws of nature in her economy and truth, imitating her in disposition, regularity and harmony of proportion, however simple in plan and outline, will, I am persuaded, produce in some degree the effect of quiet, restful repose.

### Parlor Elevators.

*From* MRS. H. S. R., *Redwing, Minn.*—In response to an inquiry made in a recent number of *Carpentry and Building*, concerning the address of the makers of parlor elevators, I would say that the present manufacturer is H. B. Martin, 14 Ogden avenue, Chicago, Ill.

### Removing Old Putty.

*From* J. D., *Cleveland, Ohio.*—In reply to W. T. Galt's inquiry as to removing old putty, I would say that this can be done without injury to the sash or glass by passing a hot soldering iron over it. The heat of the iron softens it readily, and permits its removal with a knife or chisel without much trouble.

## REFERRED TO OUR READERS.

### Country Church.

*From* D. M. R., *Boston, Mass.*—Will you please request the readers of *Carpentry and Building* to contribute plans and elevation for a small country church, to be built entirely of wood and the cost not to exceed $2500?

### The Preston Car-Lock.

*From* N. G. A., *New York City.*—I desire to learn, through your valuable paper, the address of the makers of the Preston car-lock, such as is used on the cars of the New York, West Shore and Buffalo Railroad. Careful inquiry of purchasing agents and the trade generally has failed to give me the desired information, and accordingly I refer to your columns for assistance.

### Transom Window Frames.

*From* J. C. C., *Great Pass, Ore.*—Will some of my brother carpenters inform me how to make window frames with transoms?

### Siding Gauge.

*From* A. C. W., *Richburg, N. Y.*—I desire to learn, through the correspondence department of *Carpentry and Building*, where I can obtain a siding gauge for making siding mentioned by J. B., of Des Moines, Iowa, in a recent communication, and described as Nester's patent. I should like to know the price before ordering.

### Framing a Church Roof.

*From* W. B. R., *Ireland, Ind.*—In the November number of *Carpentry and Building* for last year there appeared an article on church roofs, from W. H. F., Terre Haute, Ind. I have a church to build, it being a frame 38 x 56 in the plan and 20 feet high. I wish to employ a Howe truss in the general manner suggested by the correspondent. The drawing accompanying his communication shows three thicknesses of stuff, for cords which he says should be 2 x 10 inches, and the braces 4 x 6 inches in size. The truss, he says, should be 1 inch in diameter. I desire to inquire of him and other readers of your paper who can give the information whether these dimensions of materials will be sufficient in my case. The truss, in this instance, will require to be 11 feet deep.

## STRAY CHIPS.

MR. ERNEST BAILLEY, architect, of Pierre, Dakota Territory, has prepared the plans of the First Presbyterian Church, about to be erected at that place. The building is described as evincing originality of design, simplicity and convenience. It is the intention of the congregation to finish the chapel, a structure 30 x 50 feet, the present season, and to proceed with the main building next spring.

MESSRS. CARPENTER, ANNEAR & Co., of Louisville, Ky., have been awarded the contract for the galvanized-iron, slate and tin work on the court house at Lafayette, Ind. The amount of the contract was $15,500.

WE LEARN that a movement is on foot in Dayton, Ohio, looking toward the erection of a new union depot, the style and appointments of which shall be commensurate with the importance of that enterprising city. While Dayton has fair railroad facilities, the depot accommodations have long been a disgrace to the community. The sanitary condition of the present structure, judging from an hour's waiting which we had occasion to do at that point a short time since, if no other reason, would indicate that something should be done, and that very speedily. Besides this, the inclosure of the present building by tracks makes it practically impossible for passengers, whether on foot or in omnibus, to get away from the station without risk of life or limb. The proposed improvement is one that has long been demanded, and, we understand, is backed by a strong popular feeling on the part of the citizens.

L. P. PARKHURST, contractor and builder, has works in progress at Ridgeway, Pa., this year. Among other edifices erected may be mentioned three three-story store buildings, two two-story buildings, a grist mill and a dwelling.

IT IS REPORTED that the work of demolition of old down-town structures in this city is to be carried on during the next six months on no inconsiderable scale. Several contracts are about to be signed for the erection of large buildings for office purposes, and it is probable that within a very few years no part of New York will present such a reconstructed and improved aspect as that south of Wall street.

MR. FRANK B. SMITH, architect, of Norfolk, Va., has lately completed plans for three dwellings and an office building, to be erected in that place. It is expected that the improvements will be completed by 1884. The cost is put at $35,000.

THERE IS BEING erected on Connecticut avenue, between K and L streets, Washington, D. C., a handsome edifice that will be known as the Casine Building. The main feature of the structure is an opera-house, having a frontage of 100 feet on the avenue. The front is circular, and, with the porticos and pillars of the outside walls, form an arcade on each floor. The portion between the opera-house and the casino is 19 feet wide and runs up to the third story, and is surmounted by a tower. The materials used are pressed brick and stone, relieved by bands of black brick and terra-cotta moldings. The style of architecture bears the general characteristics of the Italian. The interior woodwork of the theater will be cherry. The total seating capacity is about 1700. The casino part of the building consists of a series of rooms, two stories high, surrounding a central court covered by a dome roof made of iron and hammered glass. The court, which is 55 x 38 feet, will be paved with encaustic tiling, and in the center will be a handsome fountain. On the first floor and about the court will be reading, writing and dressing rooms, together with a public restaurant, with an entrance from both the ter and street. On the second floor will be a grand hall-room, 38 x 73½ feet in size, fitted up in handsome style in cherry. The floor will be inlaid, the roof arched and paneled in cherry, and above a lantern roof with stained-glass panels. The kitchen will be in the third story of the tower. The system of heating will be by both direct and indirect radiation. Mr. J. R. Thomas, of New York City, was the architect who furnished the plans. The cost of the building, exclusive of furniture and fixtures, is estimated at $110,000, and it is expected that it will be ready for use early next spring.

MR. LOUIS LACASSE, architect, of Whiteball, N. Y., has prepared plans for a hotel building to be erected in front of the railroad station in that place. The new hotel, by its location, will undoubtedly be a great benefit to the traveling community. The architect estimates the cost at $8000.

HON. D. P. STUBBS, of Fairfield, Iowa, is rebuilding a business block recently destroyed by fire. The new structure is to be of brick, 43½ feet front by 120 feet in depth, and two stories in hight. The first floor is to be divided into two storerooms, while the second will be occupied as offices, &c. The front of the building is glass and woodwork to within 2 feet of the upper cornice, where it is spanned by two arches of alternate stone and brick voussoirs. The front was the work of Mr. George W. Payne, architect, of Carthage, Ill., and is described by the Fairfield *Tribune* as being of superior elegance and unique design.

CONSIDERABLE ACTIVITY prevails in the business line in Knoxville, Tenn. One of the finest buildings in this city is that recently completed for the Knoxville Fire Insurance Company. A number of brick edifices for store and office purposes are in progress, besides numerous buildings scattered through the city.

# CARPENTRY AND BUILDING

A MONTHLY JOURNAL.

VOLUME V. NEW YORK=DECEMBER, 1883. NUMBER 12

## Third Prize Design, Eleventh Competition.

We take pleasure in presenting herewith another study in the elevations and details of the seven-room frame house. The design shown received the third prize in our Eleventh Competition, and, as our readers have already been informed, is by Mr. J. F. Moore, architect, Minneapolis, Minn. The design in this contest receiving the second prize has not yet been published, but will appear in a subsequent issue. The present design, as will be noticed by reference to the elevations, shows a feature of construction, or finish, which, although not new, so far as use is concerned, has never before appeared in any of the designs we have published. We refer to the plaster work on the exterior of the second story. The following description of the design is from memoranda by the author, who prefaces his remarks by the assertion that he has studied the problem before him with a view to the main condition—namely, cheapness—yet at the same time endeavoring to present a design he would not be ashamed to own were it executed.

Few shingles are employed on the vertical walls, because cut dimension shingles cost more than siding. A band of shingles only is used coming on a line with the piazza roof and serving to break up the vertical lines of the sides. Below this band drop siding is intended to be used, and above it, for the reason of cheapness and also of rich effect that can be obtained by its use, rough cast plaster is intended to be employed. Dark olive-green is suggested as the color for the trimmings, light whitish-green for the body of the house, with roof, if painted at all, of Venetian red, toned with burnt amber. For the underpinning ledge stone has been intended.

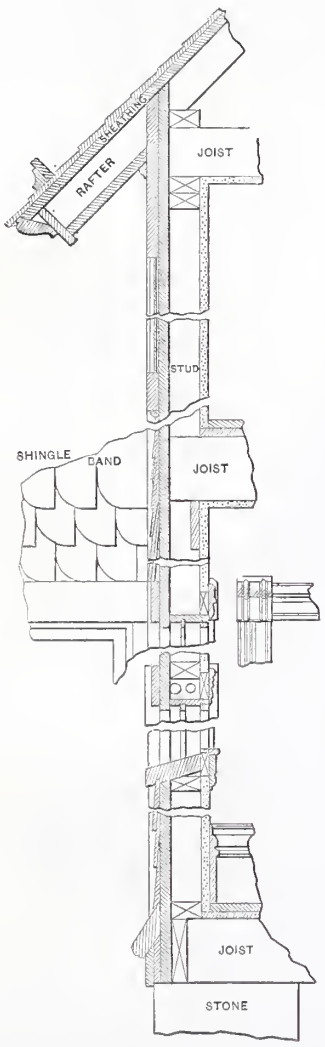
As will be seén by the detail, Fig. 8, it is intended that the gable of the porch shall slope. The dotted lines on the main roof in the side elevation indicate the continuation of the hip roof to the vertical gable of the front. Sufficient attic room for storing purposes is afforded by the construction shown, windows being introduced for the purpose of light, but more especially for keeping the second-story rooms cool in summer. A gable is employed on the left side, over the dining room, which makes that side of the building as pleasing as the other, and also renders the house suitable for an inside lot as well as for a corner lot. The hights of stories are as follows: First story, 9 feet 3 inches in the clear, and second story 8 feet in the clear. Joists for first floor, 2 x 8 inches; second floor, 2 x 8 inches, and attic floor, 2 x 6 inches. Details of doors, chimneys, front stairs, kitchen wainscoting and other parts are given.

THIRD PRIZE DESIGN, ELEVENTH COMPETITION.—PERSPECTIVE VIEW OF STUDY, BY J. F. MOORE, ARCHITECT, MINNEAPOLIS, MINN.

## On the Use of Building Stones.*

BY JAMES GOWANS.

In the paper I had the privilege of bringing before the association last winter, I pointed out the characteristics of good building stones, and the principal quarries in Scotland from which such could be got. I stated that what the architect had to look for was a stone that was durable, strong, and of a color which would best bring out the architectural features of his design and harmonize with the locality and surroundings in which it was placed. We have, fortunately, within easy reach, abundance of stone combining these qualities; but, however good or beautiful it may be, if wrongly used, disappointment and failure are sure to be the result. The laws observed in regulating the elements and forces in nature are thoroughly geometric, and the same laws




*Third Prize Design, Eleventh Competition.—Fig. 2.—Vertical Section Through Exterior Walls.—Scale, ¼ Inch to the Foot.*

are equally binding on the architect in his works. The constructive lines on which nature proceeds never fail, when free from debasing influences, to secure what we call the beautiful in form, color or usefulness, and the same lines cannot be too closely followed by the architect or builder who desires to reach excellence in an art which is noble in the highest sense of that word.

I know that it is held by many that the architect or artist is only trammeled in his conceptions by working on geometric lines. Some men, no doubt, have an intuitive perception of what is symmetrical and beautiful, either as to form or color, just as there are those who, without the aid of gamut or scale, have an inborn knowledge of what is harmonious in music; but I hold that in architecture, as applied to the true styles, a geometric basis is at the root of what we admire in the examples we have of these, and that, if a new style of architecture is to be developed, we must fall back on what guided the old designers in their original conceptions of what was not only true to its use, true in construction, true in symmetry, but beautiful as well, because it was true—the cube, the circle and its geometric development giving that which we admire and call classic, while the circle and the equilateral triangle supply the key to those noble Gothic structures which were erected 500 years ago.

Before I enter upon the consideration of the uses of stone, I wish, in a sentence or two, to notice the use of timber and iron as constructive materials. There is a true way of using these, just as there is a way of using other building material, such as stone; but a serious mistake will be made by the architect or engineer if they attempt to use these on the same lines or for purposes which by their nature they are not at all applicable. As to the first, the designer who understands what timber as a constructive material can do would never think of using it for the purposes of an arch, especially one which has to meet the strain of a vertical and moving load. Yet this has been done on some of our

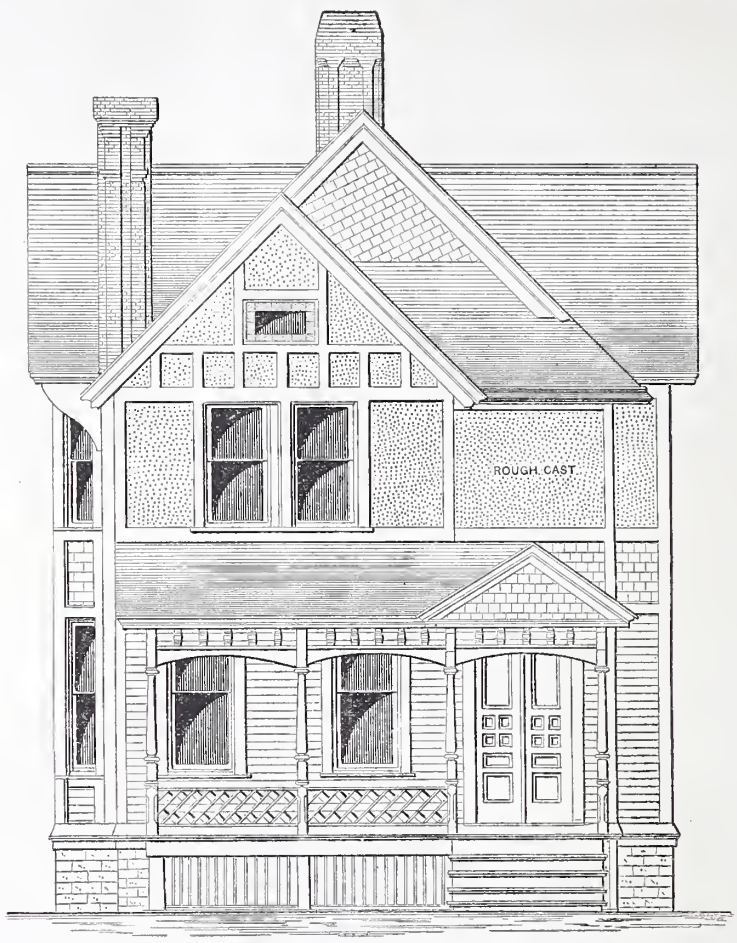



*Fig. 3.—Front Elevation.—Scale, ⅛ Inch to the Foot.*

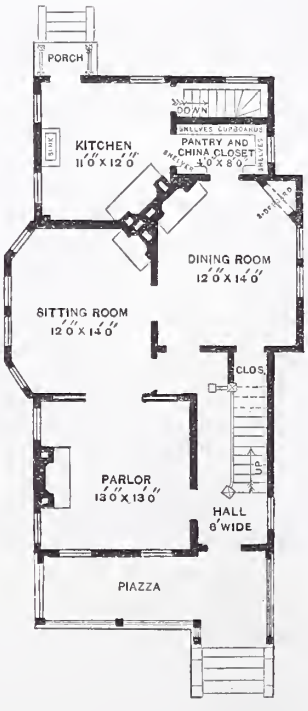



*Fig. 4.—First Floor Plan.*

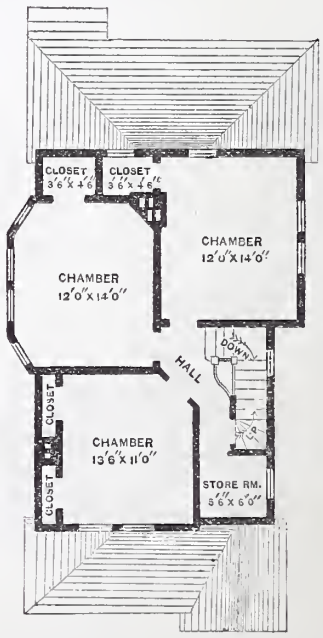
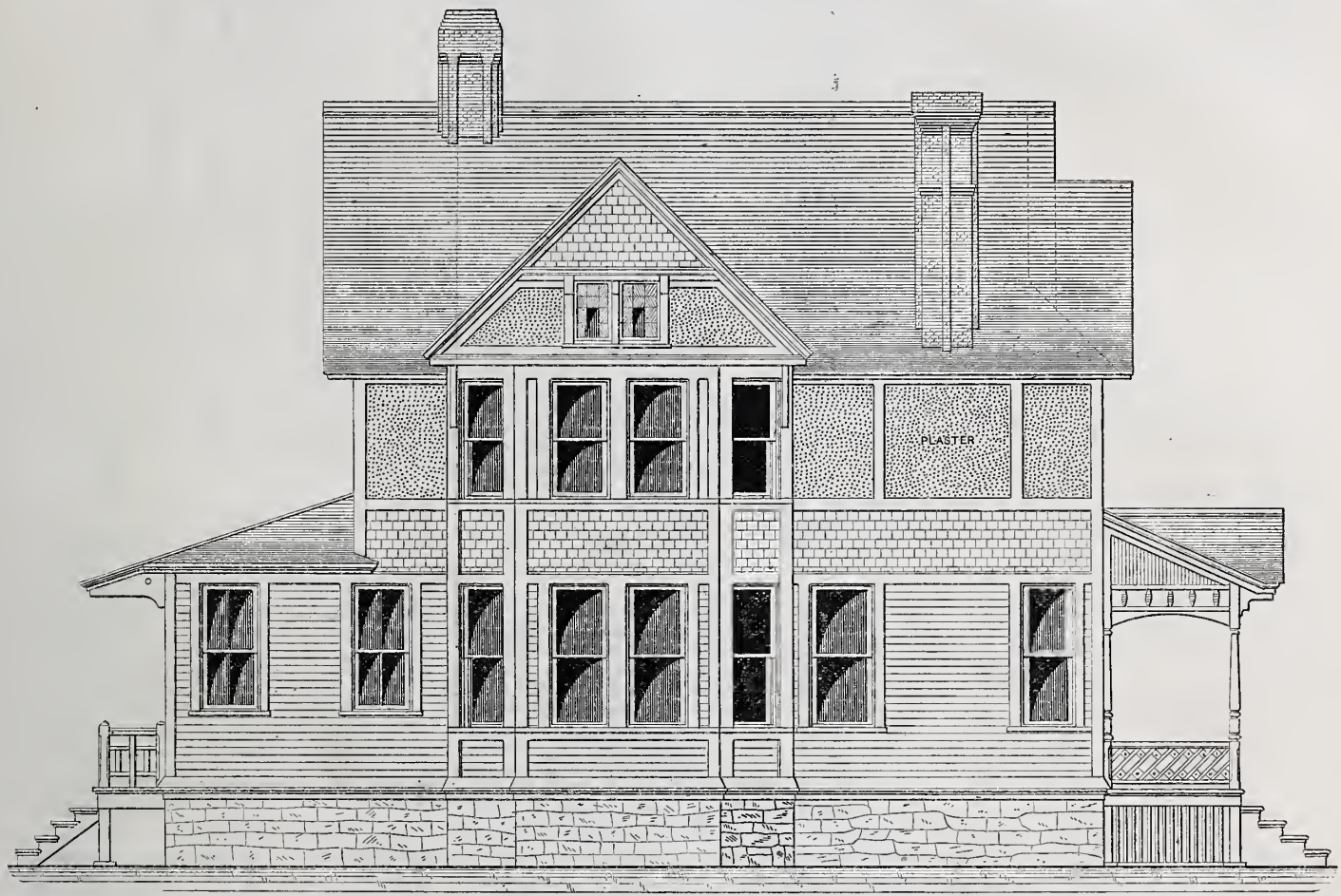



*Fig. 5.—Second Floor Plan.*

*Floor Plans.—Scale, $\frac{1}{16}$ Inch to the Foot.*

* A paper read at a meeting of the Edinburgh Architectural Association.

most important railways in the construction of bridges and viaducts. Neither should iron be used for purposes which stone or other material is only fit for. To build a structure on constructive lines which admit of play or movement when the weight and thrust of a railway train or moving force come against it or upon it, is certain in time to be fatal. Hence the care that should be taken, whether with stone, wood or iron, to adopt a system of construction which will not only meet the nature of such material, but the work it has to do.




*Third Prize Design, Eleventh Competition.—Fig. 6.—Side Elevation.—Scale, ⅛ Inch to the Foot.*

To unite wood and iron where their opposite properties can never harmonize and work together is sure to fail in the long run, as, under a strain or load, timber, from its greater elasticity, will yield to the pressure, but again recover its normal condition after the strain or load is removed. Iron, on the other hand, will keep the set it gets, and, if united to the timber, is certain to drag it down to the weakness which is inherent to such a combination of material. What I have said about wood and iron is rather aside to my paper, except in illustration of what I consider so nearly allied to the use of stone that I trust the association will overlook the digression. The right use of stone is my subject, and I will endeavor to keep as close to my text as possible, giving in a practical way the results of my own experience, and what I have learned from others. To be in order I will consider: 1. How to secure a foundation upon which the structure can be safely built. 2. How to place stone in the building so as to secure the greatest strength and durability. 3. How to use stone in the laying of a good foundation. 4. How to use stone in the building of retaining walls. 5. How to use stone in the building of rubble. 6. How to use stone in the superstructure. 7. How to use stone for coursed work. 8. How to use stone for ashlar work. 9. How to dress stone so as to get the most durable surface.

### 1.—*How to Secure a Foundation upon which the Structure can be Safely Built.*

The foundation of a building is of primary importance, as, unless it is secure, the permanency of the structure cannot be maintained, however well built it may be. Before laying a stone, the architect or engineer should be satisfied that the strata will give equal resistance to the pressure that may be put upon it. Strata that is hard and soft is very dangerous. Even clay, if mixed with bowlders (which often happens), cannot be depended upon unless they are removed and means taken to equalize the ground on which the buildings are to be erected. Next to rock, no better foundation can be got than sand or gravel, when dry. If wet, means should be employed to drain away the water; but, if this cannot be done, large flat-bedded foundation stones of sufficient area, fairly dressed in beds and joints, and well put together, will, as the load increases, secure a foundation that anything can be built upon.

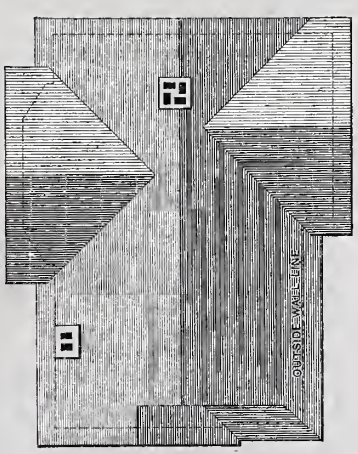
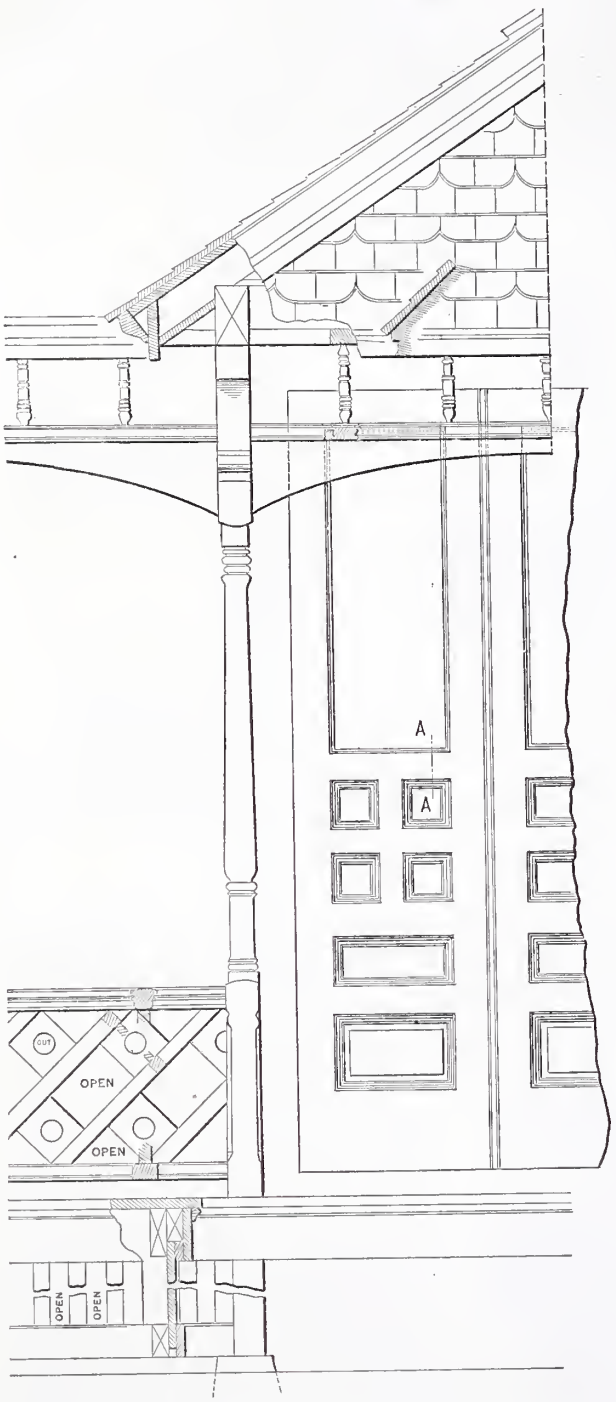



*Fig. 7.—Roof Plan.—Scale, $\frac{1}{16}$ Inch to the Foot.*

In my own experience I have often tested this, and particularly when building a bridge on a railway contract I had many years ago. This was an under bridge of considerable span, the girders being in the form of an arch, in segments of cast iron, the security of which depended greatly on the permanent resistance of the abutments, or the bolts which held these segments together at their joints. In digging for a foundation, it was found that the strata was very soft, being layers of sand and moss alternately, and to prevent failure I took the precaution to strengthen the foundation of the first abutment by driving piles to a depth of 30 to 40 feet, with horizontal planking, on which the foundation stones were bedded. Before building the second abutment, acting on the advice of a railway contractor who had had more experience than myself, I adopted a different plan, viz., to dig out the soft material to such a depth and area as secured an outward resistance to meet the pressure of the large-sized stones that were afterward put into the foundation, course after course, until the load pressed out the water, and so secured a foundation which was equally as strong, if not stronger, than the first. Where the strata is unequal or not to be depended upon, I know of nothing better than a good bed of concrete, certainly not less than 3 feet thick, and no architect should neglect this where there is the slightest doubt as to the sustaining character of the ground. This is always necessary in erections of different hights, and is particularly required in churches and other buildings where the spire, tower or other elevation bears more heavily on the foundation than the walls which abut upon them. And, in addition to this and to make sure, I would have extra courses in the foundation of the higher and heavier portions, as in the hurry with which we build nowadays every precaution is necessary. The same care should be taken with respect to oriel windows or projections which do not go to the full hight of the building, and consquently have not the same pressure on the foundation. The walls to which these lighter projections are attached should not only be well founded, but the tie or bond which unites the one wall to the other should be left free on the upper beds, so as to allow for the subsidence of the heavier wall without causing the fractures so often seen where this precaution is not taken.

2.—*How to Place Stone in the Building so as to Secure the Greatest Strength and Durability.*

Before saying anything as to the various kinds of work put upon stone, or the modes of building, let me state that for durability all stones should be laid on their natural beds, especially such as are highly stratified. All stones, however compact in their nature, have a line of fracture which the quarryman or hewer can easily detect, and although there are a few stones, such as the Liver Rock of Cragleith, Binnie and Redhall, which show little lamination, and may be used with the natural face exposed, the use of stone in this way should be the exception and not the rule. Another consideration in the use of stone for important buildings is that of having it quarried, stored and seasoned for some time before being hewn and placed in the walls. By these means the natural sap is allowed to evaporate, and the stone tested as to its quality. This would add to the cost, but the money would be well spent if this precaution preveuted the wasting of stones from the rains, frosts or atmospheric influences which, especially in our cities, soon act on the surface of a newly-quarried stone.




*Third Prize Design, Eleventh Competition.—Fig. 8.—Part of Front Piazza, Showing Front Doors.—Scale, ½ Inch to the Foot.*

Stone that is quarried the one day and built in the next is in a green state and unfit for use. It is not in condition—it is at its weakest; its pores are open and ready to absorb not only moisture, but the gaseous and disfiguring influences which tend to its destruction. Every hewer knows that to get a polished surface on a stone that has lain for some time is very different from what he gets on one fresh from the quarry, and this of itself should be sufficient evidence to warrant the procaution I have recommended, which is to thoroughly season the stone before using. To know what good stone really is, and how it can be best used, the architect who practices in this city, or the student, has not far to go to see not only the most durable stone, but also variety of masonry, as exemplified in such as Holyrood, Heriot's Hospital, and the residential buildings of the Old Town, erected centuries ago; or, turning to the modern buildings of the New Town, stone of equal durability and variety of masonry, as shown in the polished work of the better-class buildings of the terraces, crescents and squares, such as Royal Terrace, Randolph Crescent, Moray Place or Charlotte Square; while in George Square, Gilmore Place, Thistle street, Rose street or Jamaica street, work of a cheaper kind has been adopted, all which are not only instructive, but interesting, in showing what masons could then do in erecting buildings that have stood the test of time, which makes no mistake in exposing what is good or bad in many things besides the art of building. My next consideration is

3.—*How to Use Stone in Laying a Good Foundation.*

In my paper on "Building Stones" I gave the result of some experiments in testing foundation stones for the chimney of the Edinburgh Gas Co., and the results of these experiments proved to my mind that as you enlarge the area of the stone a greater proportion of resistance is gained, and that a laminated stone, such as Hailes, would increase in strength according to its surface more in proportion than that of a Liver Rock stone, such as Redhall or Craileith. I notice this more particularly to show that a soft stone need not be rejected if laminated, of large area, fairly dressed on the beds and joints, and bedded on what I would call a swimming bed of mortar, so that every portion of the surface of the stone would get a fair share of the work it had to do.

Foundations should have the courses of sufficient breadth to admit of scarcements on either side and all round, so that the wall pier or pillar resting thereon may have a good footing, and equal resistance through and through to prevent sinking. I have known, from the neglect of this, worse than subsidence happen, owing to the foundation courses being filled with ordinary rubble in the center, which, yielding when the pressure came, brought down the building, involving not only loss of life and property, but questions of responsibility that had to be settled in a court of law. The subsidence of the walls of a building, occasioned by a bad foundation or inferior work above, does not show itself all at once—it takes time to tell whether the foundations have been well or ill laid upon an unyielding strata, badly bedded stones or a faulty construction; but once it does begin to fracture, the unequal, and what I would call the unfair, strain thrown upon other portions soon leads to serious consequences.

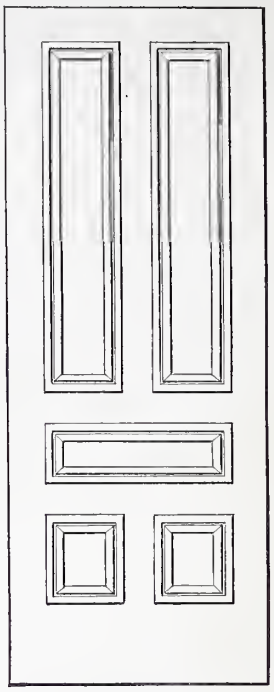


*Fig. 9.—Inside Doors.—Scale, ½ Inch.*

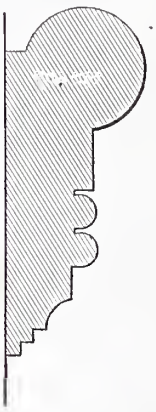


*Fig. 10.—Picture Molding, Full Size.*

4.—*How to Use Stone in the Building of Retaining Walls.*

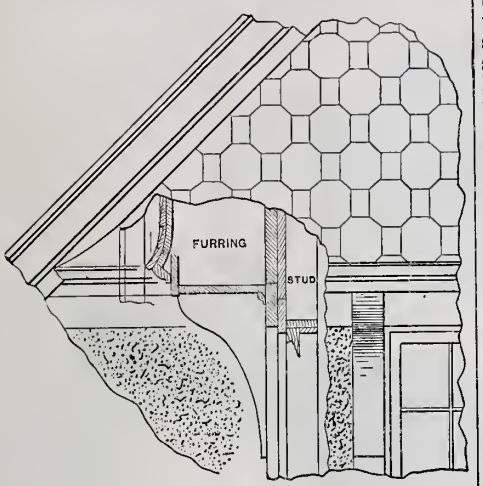
The chief object here is to build so as to lean to and resist pressure from behind. To do this satisfactorily, the excavations should be dug deep enough to secure the resistance necessary to meet the thrust when it comes; the walls should be built of the largest material that can be got, and bedded at right angles to the batter on the face. Small-sized stones in such a wall are useless. Heavy material, well dressed and bonded together, so that when the pressure comes—in most cases suddenly—every stone will be ready to take its fair share in preventing an overthrow, is what is wanted.

*Fig. 11.—Front Stairs.—Scale, ½ Inch.*

(To be continued.)

## The Brass Revival.

One of the outcomes of the æsthetic mania —the revival of a fashion for the furniture and fittings of our grandmothers—is the sudden inroad of brass fittings. It is only a few




*Third Prize Design, Eleventh Competition.—Fig. 12.—Side Gable.—Scale, ¼ Inch to the Foot.*

years, if the term may be dignified by so indefinite a period, since a poor, worn, oxidized placque of doubtful brass or latten ware, or a flagon with an embossed pattern, which, by a compliment, was called *repoussé* work, brought a fabulous price.

There were long discourses on the *patine* of the metal, its discoloration, and the thousand nothings which go to make up value in the eye of an artist-antiquary. The objects were artistic, there was no doubt. They were effective on a sideboard, and they represented an era of art which seemed to have passed away. There were, of course, brass founders, as there have always been since brass was an article of manufacture, but they had devoted themselves for years past to ormolu or lacquered bronze work until the Ecclesiastical revival brought brass again into note. People of observant habits had noted the wondrous tone and brightness of many of the effigies in latten ware which have been preserved in our churches. There are alms dishes scattered about the country made of a similar metal, and there was no valid reason why the use of it should have been so restricted of late years. The bushes and bearings of machinery, stair-rods, door-hinges and escutcheons, window-fastenings and harness buckles vied with gas brackets and imitative gold cornices to monopolize brass in domestic use. Its native hue and its somewhat impudent beauty were hidden and checked by the use of lacquer, or a plunge in the bathing-trough of the electroplater. There were, in the nurseries of some old-fashioned houses, in some roadside inn parlors and bars, an odd fender, a few candle-sticks or a poker and tongs, made of this once-popular alloy. As a material of domestic art its occupation was gone when paper mounts superseded metallic "mats" for photographs. It reappeared in the sham gold moldings, but this was under a deceptive form. Its true reappearance was in the smoke-begrimed platters, plaques and tankards, with figures and armorial bearings in high relief. There was soon a demand for these semi-foreign antiques, and soon was the demand supplied. There was no reason to believe that these duplicates and varied specimens were manufactured for the occasion. They were common enough in the Low Countries, and the owners were easily tempted to part with them. There were no signs of forgery, for there was no necessity at first to forge, but as time went on other patterns came to the fore. They ceased to be scarce. They became a part of the new fashion, and they were the forerunners of the cheap, unpretentious frames of brass which are now in every shop window, and are to be found in almost every house of any pretensions. They are neat and not gaudy. They may not be high-class art, but they are far beyond the meretricious decorative frames and ornaments which

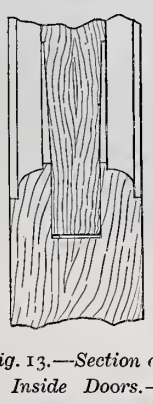
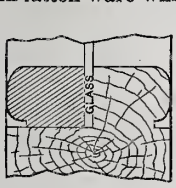


*Fig. 13.—Section of Inside Doors.—Half-Full Size.*



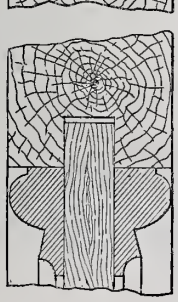



*Fig. 14.—Section on Line A A, Front Door.—Half-Full Size.*

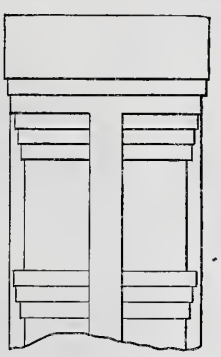


*Fig. 15.—Front Chimney.—Scale, ½ Inch to the Foot.*

cost twice the money, and will not remain a tithe of the time "a thing of beauty," and certainly not at "a joy forever."

Whether it was this fresh ebullition of Chippendaliana, or the ingenious device of a foreign jeweler, who formed ornamental—and, indeed, beautiful—necklaces and necklets out of the perforated shields of the balance wheels of the old-fashioned "verge" watch, that directed attention to "brass," as a domestic metal, we have now, in addition to brass bedsteads and brass pendants, brass in all shapes and sizes adapted to all sorts of uses. It began by displacing the knobs and handles of drawers and cabinets. It has waged war with Mediæval stone edges to encaustic hearths. It began with "andirons," and then "fire-irons" gave way to brass fire implements, and, lastly, to the brazen fender itself. Candelabra, clocks, inkstands, brackets, tea-kettles and flower-stands are now universal of this commonplace, vulgar metal, which lends itself so unblushingly to every use, except the proverbial "brass farden," which is supposed to represent the lowest possible value of any known coinage in the United Kingdom. We cannot say that we regret this freak of fancy for brass in its various qualities, for there is "brass" and "brass," and it lends itself admirably to many purposes for which other metals are not so suitable. Its worst quality is that of susceptibility to acid or acidulous fumes, which renders it so unfit and dangerous for cooking purposes. If constantly handled it not only soils the hands, but gives out an unpleasant odor. Its use is therefore restricted. Like highly-polished steel, it will retain the impression of the fingers, to the great detriment of its fine glistening surface, unless it is varnished, for lacquering is only another name for the same thing. The lacquer itself has a tendency to wear off, or become susceptible itself of holding dirt, and it was this which led to its supersession by nickel, electroplate, and common japanned goods in our household economy. As door-knobs it has given way before wood, ebonite or porcelain, which require less attention to keep bright and clean.

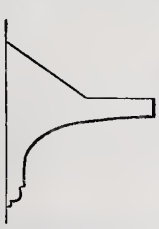


*Fig. 16.—Bracket, Front Piazza.—Scale, ½ Inch to the Foot.*

The new Age of Brass has an opponent with which it is difficult to deal. This ornamental brasswerk is all very well and very proper in its place, where the lighting of the rooms is confined to candles, or

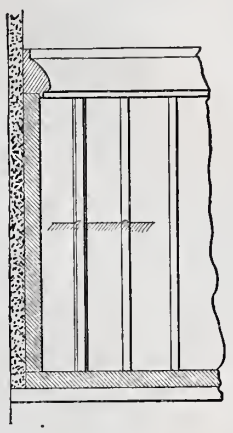


*Fig. 17.—Kitchen Wainscoting.—Scale, ½ Inch to Foot.*

any of the various oil or spirit lamps. The genii of carbureted hydrogen has worsted it once by its sulphurous breath, and will do so again, in spite of lacquer or varnish. They are incompatible without incessant attention and labor. Many varieties of coal at once tarnish it, and coal-gas is its mortal enemy. The designers of polished brass-

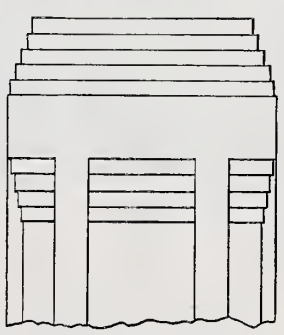


*Fig. 18.—Rear Chimney.—Scale, ½ Inch to the Foot.*

work seem to have forgotten this, or have charitably thought that artistic purchasers would overlook this technical and practical fact. The gold-like luster soon fades beneath the hot glance of King Coal. The Age of Brass may not be considered now the age of shams; but ere brass again becomes a universal and popular piece of

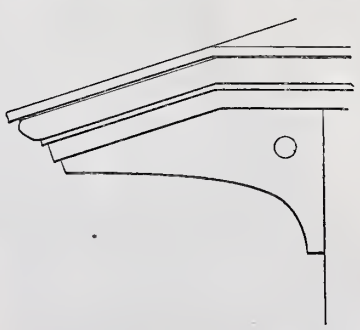


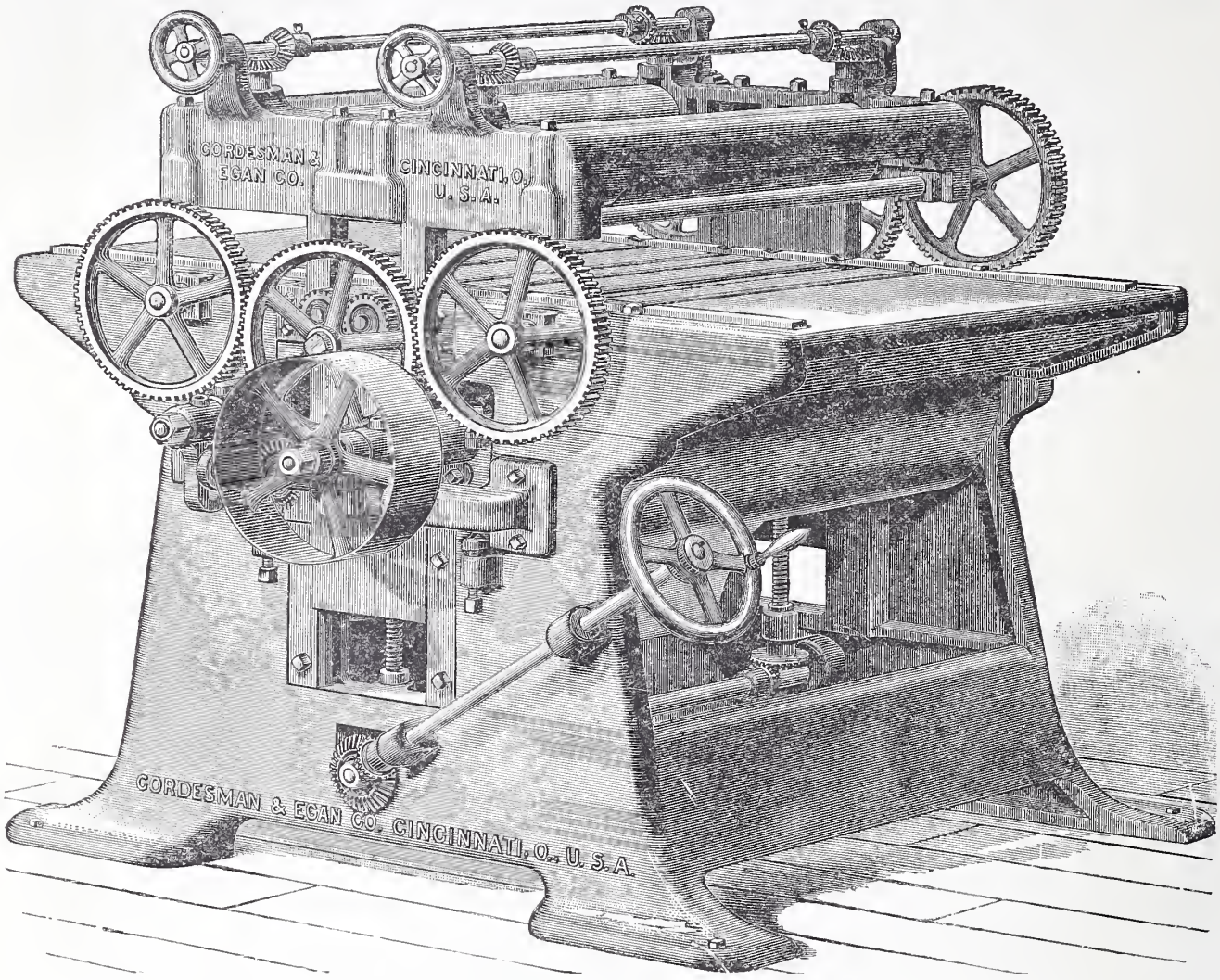
*Fig. 19.—Hood Over Rear Steps.—Scale, ½ Inch to the Foot.*

decorative furnishing, the electric light must become universal in our larger mansions, or the various mineral oils displace the all-prevalent gas in our larger towns. Brass became unpopular under the newer conditions of domestic illumination, and those conditions have not changed among those who might otherwise welcome the renewal of the Age of Brass.

## NOVELTIES.

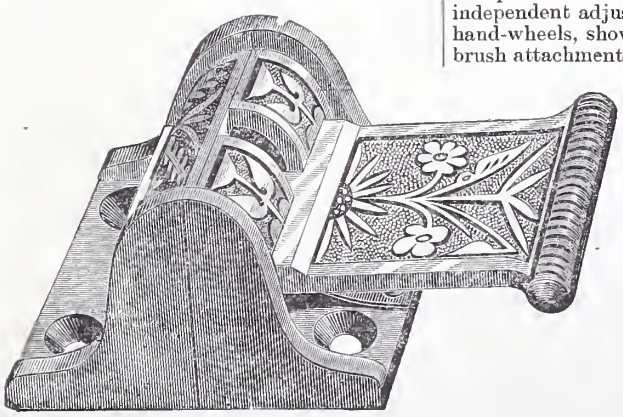
### New Sandpapering and Polishing Machine.

The importance of sandpapering and polishing in various lines of work has long been apparent to manufacturers of wood-working machines, and the probability of producing a machine that would accomplish a finish of this kind equal or superior to that done by hand has long engaged the attention of inventors. The accompanying engraving represents a machine doing work of this kind, recently produced by the Cordesman & Egan Company, of Cincinnati. The manufacturers claim for this device that it is superior to others which have preceded it, both in quality and quantity of work produced, and also in the ease, convenience and economy of operation. They claim for it, further, that the feed is more powerful and positive than on other machines; that the brush attachment is arranged in a superior manner, and that every part is readily accessible. The usual all-around hand-feed, which is very liable to get out of order, has been dispensed with, and its bed is supplied with a hand-gearing by which the whole upper part of the machine is raised and lowered at once. The feed consists of eight geared rolls. The four feed rolls are set in the center and between the two drums, so that very short stuff can be worked. All the upper feed rolls and pressure rolls can be instantly adjusted by a hand-wheel placed in front—a matter of great convenience to the operator. The pressure rolls over the cylinder have an independent adjustment by means of small hand-wheels, shown in the engraving The brush attachment on this machine is placed inside of the polishing rolls, and the work is thoroughly brushed and cleaned before going through the last part of the feed-polishing rolls. Either or both polishing rolls can be vibrated at one time. The fact that the brush is put inside of the feed-polishing rolls makes it possible to run the drums in opposite directions, thus securing the great *desideratum* of having one drum raising the fiber and the second drum—the smoothing drum—taking it all off the wheel. The brush cleanses the work before it passes through the feed-polishing rolls. Still other advantages are pointed out in the manufacturers' circular.

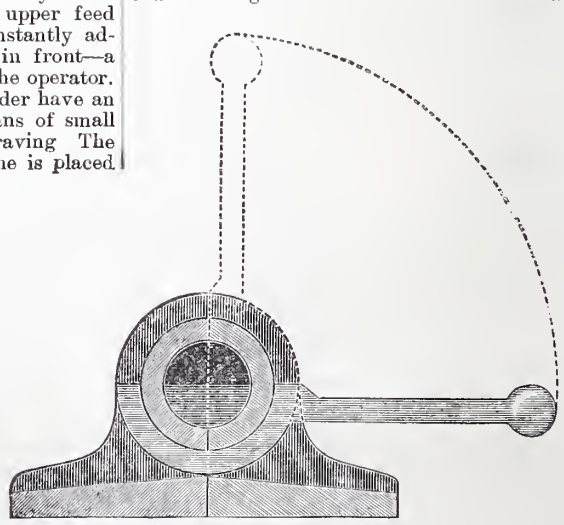



*Novelties.—Fig. 1.—New Sandpapering Machine, Built by the Cordesman & Egan Company, Cincinnati, Ohio.*

Three sizes of these machines are made, working 24, 30 and 36 inches wide. The latter machine will work up 37½ inches, thus enabling it to take a common door in a way to make a first-class job of it. In thickness the capacity of the machines is from 4 inches to the finest veneer.



General View of Lock Closed.



Sectional View.

*Figs. 2 and 3.—New Sash Lock, Made by the Nimick & Brittan Manufacturing Company, Pittsburgh, Pa.*

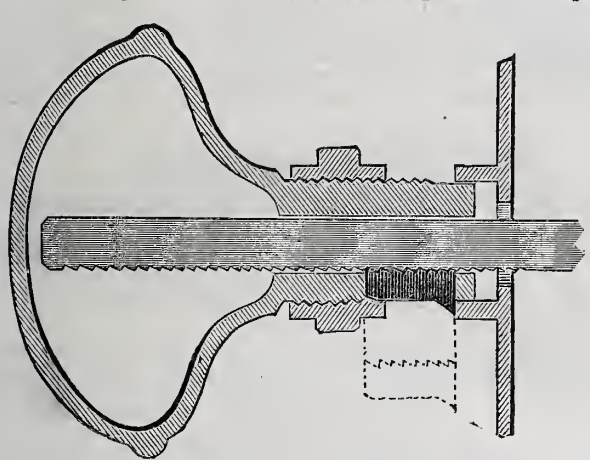
### A New Sash Lock.

Figs. 2 and 3 show the construction of a new burglar-proof sash lock which the

Nimick & Brittan Manufacturing Company, Pittsburgh, are putting on the market. It will be observed that the lock is operated by a vertical lever, the movement of which is shown in the illustrations. Fig. 2 is a full view of the lock when closed. Fig. 3 is a sectional view, indicating the movement of the lever in the operation of locking and unlocking. The lever is curved at the end, and so adapted to move from a vertical to a horizontal position and clasp securely the corresponding portion of the lock. The special merits which are claimed for this lock are that it is absolutely burglar-proof, it being impossible to unlock it from the outside by the insertion of any instrument between the rails; that it does not require for its successful working that the meeting rails be exactly together; that it is simple and strong in construction and not liable to get out of order, and that it binds the sashes firmly together, preventing all rattling of windows.

### The Morris Door Knob.

Fig. 4 illustrates a new invention in door knobs, manufactured by the Morris Sash Lock Company, of Cincinnati, Ohio, the special features of which are a revolving screw thimble upon a serrated spindle in connection with a serrated drop, over which the thimble is turned, holding the spindle in position and fastening the whole securely, thereby entirely avoiding the use of washers and screws; also a rose that has upon its interior side wedge-shaped teeth, so arranged as to fit the grain of the wood, and securing



*Novelties.—Fig. 4.—Sectional View of the Morris Door Knob.*

it to the same without the aid of screws. The interior construction of this device is clearly shown in the engraving. In external appearance the knob does not differ specially from other first-class goods, unless it be in presenting a neater appearance. These goods are manufactured in bronze, of ornamental design, and are adjustable to any thickness of door from 1¼ to 2½ inches.

### A New Screw-Driver.

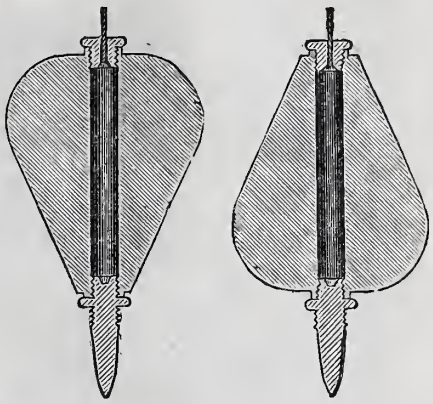
Fig. 5 represents a new screw-driver, which is being put on the market by the Russell & Erwin Manufacturing Company, of New York. The peculiarity of its construction is plainly exhibited in the cut—the blade extending through the handle, as shown by the dotted lines, into a metal lock

*Fig. 5.—New Screw-Driver, Made by The Russell & Erwin Manufacturing Company.*

or socket, making a secure fastening and giving a greater purchase in use. The hole in the handle through which the metal socket is inserted is then closed and concealed with a wooden plug. Carpenters and other mechanics who have been annoyed by the handles of their screw-drivers splitting, or by the handles, when worn and old, turning on the shank of the blades, will doubtless find in this device a satisfactory solution of the difficulty. These screw drivers are forged from cast steel, neatly finished, with black handle, and are designed to meet the demand for a strong and durable article.

### Vajen's Reversible Plumb-Bob.

Messrs. Vajen & New, of Indianapolis, are offering a new form of plumb-bob which pos-



*Figs. 6 and 7.—Sectional Views of Vajen's Reversible Plumb-Bob.*

sesses features of interest to builders, masons and all mechanics who ever have occasion to do fine and accurate work. It is said to be capable of adjustment to all the forms required by millwrights as well as civil engineers. The manufacturers direct attention to its shape, the material of which it is made, the finish, and also its peculiar construction. A hole extends through the bob, which is furnished at one extremity with a mill-tempered steel point, and at the other with a screw-cap. The threading of the two ends of the hole and upon the cap and point is such that these parts can be used from either end. The cap is perforated for receiving the line, the lower end being concave to receive the knot and give the string a bearing exactly in the center. The steel point is made somewhat smaller than the hole through the bob, so that when the article is not in use the point may be reversed and screwed into the bob in a way at once to protect the point from damage in handling and to make the article of more convenient shape for putting away. The material employed is brass, it being handsomely finished in nickel. Provision is made for adjusting the bob and restoring it to truth, in case such a course ever becomes necessary. Figs. 6 and 7 are sectional views, showing the bob in two different positions for use.

### A New Transom Lifter.

Fig. 8 represents an improved transom lifter, made by F. A. Reiher & Co., 11 and 13 South Canal street, Chicago, Ill., which is designed to obviate the difficulties met with in the ordinary article. A represents the stationary locking bar, which is fastened by two brackets to the door casing, and which receives the spur of the locking bar B, thus holding the transom in any desired position. In opening and closing the transom the block B is moved up and down by the operating rod C, near the end of which is a spur which fits into the notches of the locking bar, where it is held by a spiral spring connecting the block B and the operating rod C,

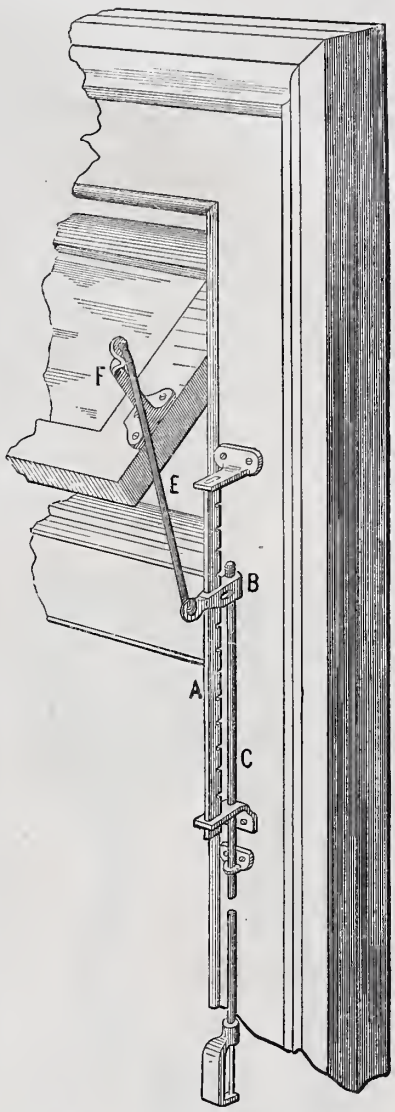



*Fig. 8.—New Transom Lifter.*

until by turning C the spur is freed from its hold and the block permitted to run up and down the bar. In brief, by turning the operating rod the spur is disengaged from the locking bar, and then by moving it up

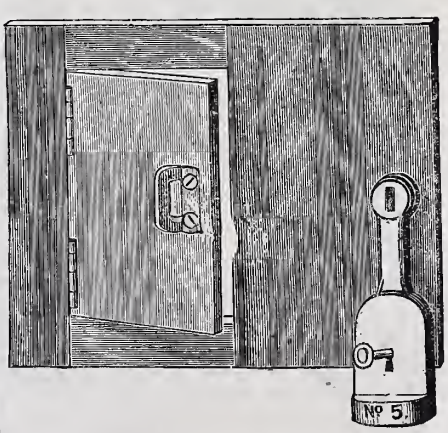



*Fig. 9.—Self-Acting Hasp Lock.*

or down the position of the transom may be changed, and when the desired position is reached the spring carries the spur back and holds it in its place. By changing the position of the locking bar and modifying the length of the arm E, this lifter can be adapted to transoms hinged at the bottom, top or on pivots.

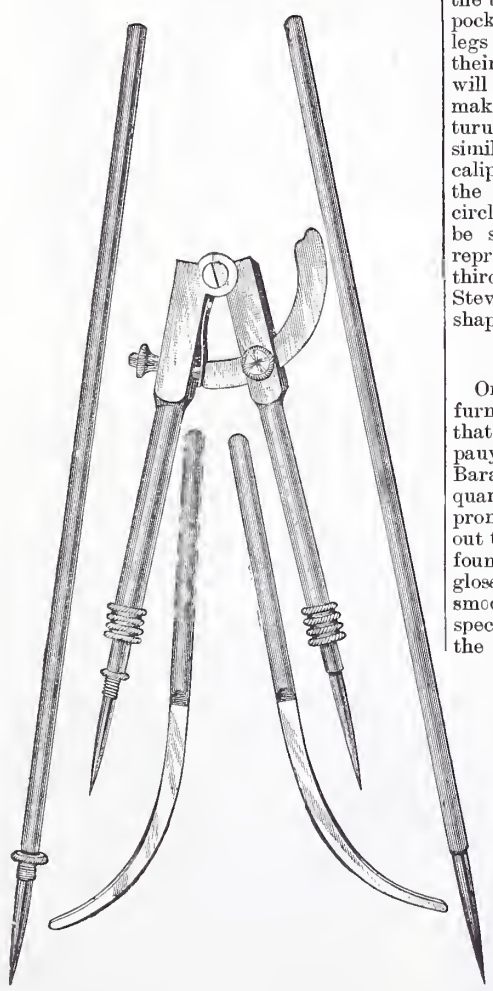
### Self-Acting Hasp Lock.

A decided novelty in the way of hasp locks is shown in Fig. 9, which represents the device applied to a miniature door. The

lock is 5 inches long, 1¾ inches wide and weighs about 10 ounces. By reference to the engraving it will be noticed that hasp, staple and lock are one piece. The lock is put in place by a screw in the hasp head, and, in putting on, the screw-driver is inserted in the head of the screw through the slit seen in the illustration, and then turned, carrying the lock with it. When it is driven home the notch in the head of the screw will be at right angles to the slit in the hasp head when the lock is locked. The catch is fastened in place by two screws, as shown, and is of such shape that it is entirely covered by the lock. From this it is evident that it is very difficult to remove the lock when locked in position. The bolt is a spring bolt, closing without the use of a key, and the parts are such as to make it difficult to pick. The device is durable, as all the working parts are inside of the case, which is a casting. The spring is phosphor-bronze, which will stand any weather. The manufacturers, the Stoddard Lock Company, No. 104 Reade street, New York, claim for it that it has a wider range of application than any other lock in the market, being suitable alike for barns, granaries,, stables, gates, inside and outside doors, chests, lockers, car doors and various other purposes.

### Stoddard's Dividers and Calipers.

A very useful combination tool has just been brought out by Messrs. J. Stevens & Co., Chicopee Falls, Mass., and is illustrated in Fig. 10 of our engravings. It serves at once as a pair of dividers of ordinary size, also dividers with very long legs, and as calipers. It is one of the handiest tools for a carpenter which we have recently inspected. As may be learned from the engraving, it consists of a pair of heavy hinged divider legs, swinging on an arc slide, with an inner adjusting spring. By the two screws provided it can be regulated to any width. One pair of divider points is 5½ inches long and the other 14 inches long. One of each pair has a reversible point which small points the ends may be reversed, thus protecting the points from injury and putting the tool in good shape for carrying in the pocket or in the tool-box. A pair of caliper legs fit the same stock, and their length is such that they will caliper 16 inches, thus making the tool useful for turning pulleys and other similar work where large calipers are required. With the larger pair of points a circle 5 feet in diameter may be struck. Our engraving represents the tool about one-third full size. We understand that Messrs. Stevens & Co. are packing these tools in shape to be sent by mail.



*Novelties.—Fig. 10.—Stoddard's Patent Dividers, About One-third Size.*

### Michigan Slate.

One of the new enterprises in the way of furnishing slate to the building public is that undertaken by the Michigan Slate Company, which is now developing quarries in Baraga County, Mich. The slate from these quarries has already been tested by many prominent architects and builders throughout the West and Northwest, and has been found of a superior quality. The color is a glossy black; the slate is remarkable for its smoothness of cleavage and strength. The specimens we have examined are among the finest slate we have ever seen. We understaud that the company are prepared to furnish large quantities of it and guarantee their product in every particular. Amoug the selling ageuts whose names appear in the company's circular we notice those of T. J. Townson & Co., Cleveland, Ohio; Knisely & Miller, Chicago, Ill.; Ed. E. Scribner, St. Paul, Minn., and T. F. & J. K. Hayden, St. Louis, Mo. The address of the manufacturers is the Michigan Slate Company, Arvon, Baraga County, Mich.

### The Shaw Door Check and Spring.

The use of door springs which, by combination with compressed air, swing the door to within a few inches of closing, and then, surely and without slamming, complete the operation, has become very general. The device shown in Figs. 11 and 12 is of this character, and is manufactured by the Shaw Door Check and Spring Comany, Messrs. Butler & Constant, No. 18 Warren street, being the general sales agents. Our engravings very clearly show the principle upon which it is constructed and the manner of applying it to a door. It will be noticed that the principal feature is a cylinder in which there is placed a piston which is operated by the swinging of the door, and the action of which is to compress the spring against which it is drawn. The closing of the door is governed by the valve at the end of the cylinder (H in Fig. 12), which can be set to make the door sheet more or less quickly. In applying, the device is attached to the door and casing, as showu in the first figure. Care is to be taken that the door does not bind either in the hinges or joints, and that the striker plate that receives the latch bolt is beveled so that the bolt will draw over easily. The spring, as shown in the cuts, may be used either right or left. It is claimed for this spring that it is so constructed that the force applied to open a door is evenly distributed throughout the machine, insuring durability and satisfactory action. The parts are so few and the construction is so easily understood that the device can be applied by any workman of ordinary intelligence.

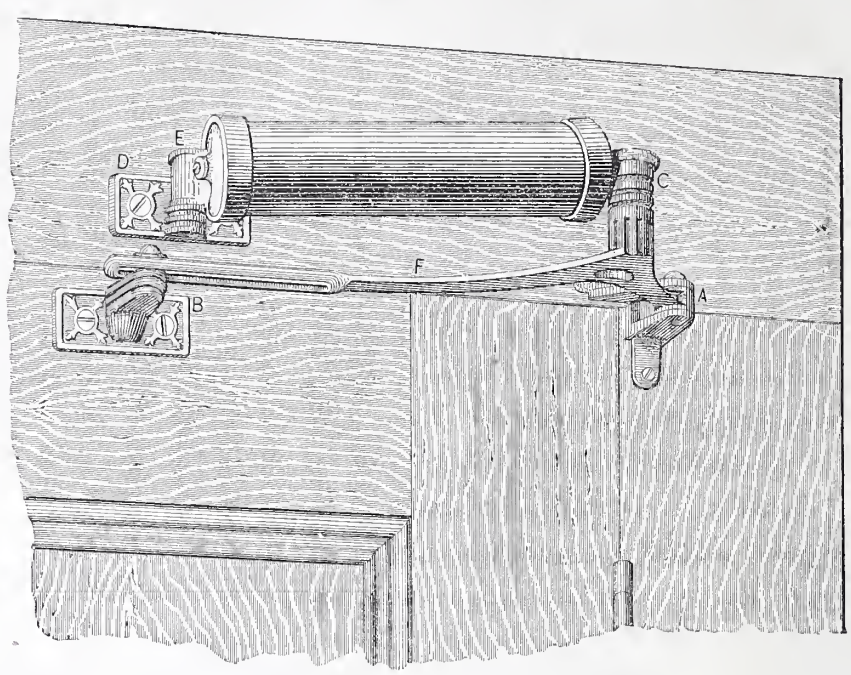



*Fig. 11.—General View of the Shaw Door Check and Spring Applied to a Door.*

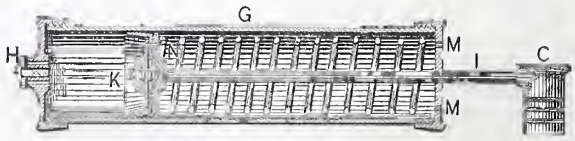
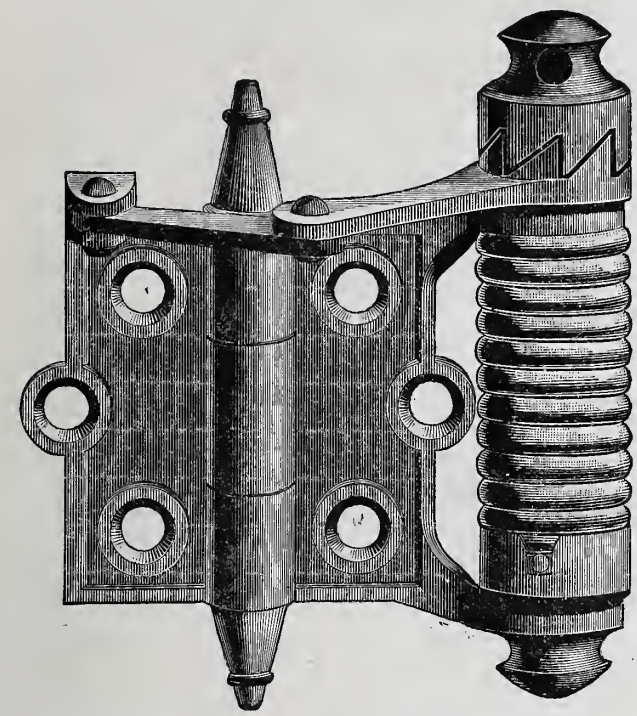



*Fig. 12.—Plan View of the Shaw Door Check and Spring.*

### The Eclipse Spring Hinge.

It is evident that the inventors are not yet done with the spring-hinge problem, for new devices of this kind are constantly being brought to notice. The latest to which our attention has been called is known as the "Eclipse" spring hinge, and is made by the Barker Hardware Company, 169 to 173 West Fourth street, Cincinnati, Ohio. It is illustrated in Fig. 13 of the engravings, which represents a hinge full size of the kind used upon screen doors. The manufacturers claim for this hinge that it is stronger in the knuckles than spring hinges as ordinarily constructed. The spring in this case is to one side, thus leaving the entire length of the pin for the knuckles of the hinge. Another feature to which they direct attention is the fact that this hinge is constructed with a loose wrought-iron pin, and that the holes are drilled and the faces of the knuckles milled, making it an accurately-workiug hinge. The construction of this hiuge is such that it exerts the greatest force when the door is shut, aud it also serves to hold the door opeu when thrown somewhat past a right angle. These features make the hinge very desirable in mauy places. The hinge shown in the eugraving,

the manufacturers represent, is powerful enough, both in its parts and with respect to the spring, to be used on medium-sized doors, and when used between connecting rooms where the door is required to be open at times the peculiar features of construction to which we have referred make it a favorite. The tension on the spring can be increased or diminished as required. The construction of the pin which passes through the spring is such that it cannot work out while in use.



*Novelties.—Fig. 13.—Eclipse Spring Hinge.*

### Pratt's Straightway Swinging Check Valve.

The difficulties attending the use of the ordinary check valves and the numerous ailments to which they are subject are well known to builders, plumbers and all others whoever have occasion to use such a device, for whatever purpose it may be employed. They are so well known that they do not need attention in describing a new form of valve which avoids them. This valve is shown in section in Fig. 14, and is known as Pratt's patent straightway swinging check valve. It is manufactured by Messrs. Pratt & Cady, Hartford, Conn. The valve belongs to the class of swinging valves, and its seat is placed at an angle of 45°. The peculiar feature of the valve itself is that it is hung from a yoke which allows it to rotate freely on its seat, and by means of an opening, closed by a plug at right angles to the seat, it can always be ground in place by using a screw-driver, without the necessity of breaking joints or connections. This feature enables the valve to be ground in place and rust or sediment on the seat to be removed as soon as discovered, it being merely a few seconds' work to remove the plug. The valve itself and yoke may be removed at any time by taking off a cap over it. The parts being made entirely interchangeable, a new disk can be slipped in place in case corrosion or an accident has made it impossible to grind the disk tight. Even this operation of replacing the valve requires but a few minutes. This ease of access, it is claimed, makes the metallic seat or metallic valve quite as desirable and durable as any of the soft or semi-elastic compounds used for valve seats and valve faces. The disk is held on a yoke turning on a pin and provided with a small projection having a hole in it, by which a hook can be inserted to remove it when necessary. The spindle on which the yoke swings is held in place by a hollow plug. It will be noticed that the diaphragm in which the valve seat is formed is curved toward the opening and in the direction of the flow, so as not to present a sharp edge to the water. A very desirable feature found in this form of valve is that the construction gives almost a straightway opening of the full bore of the pipe. Another point, which is of considerable advantage, is that there is practically no friction in the opening and closing of the valve, and certainly no opportunity to stick. Rising from its seat obliquely will have little effect on the operations, since there are no straight guides to cause friction and interfere with the working. The disk can be made, when desired, to receive rings of Babbitt metal, leather or other substances, so that those who do not wish the metallic seats can be accommodated.

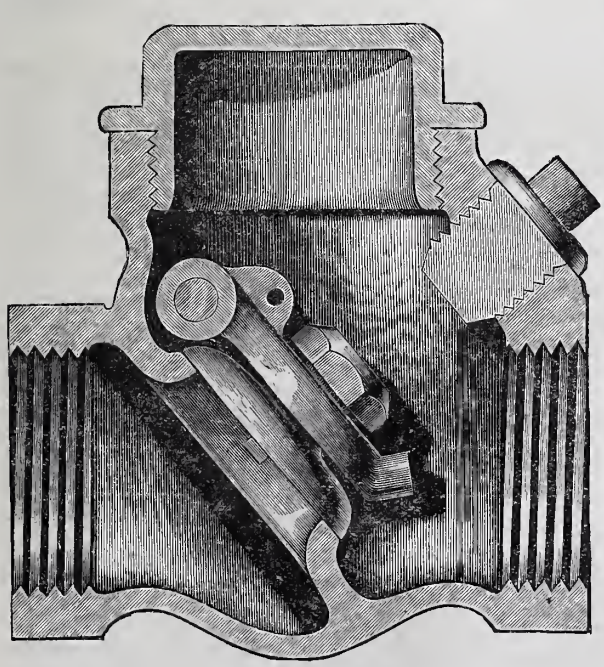


*Fig. 14.—Sectional View of Pratt's Straightway Swinging Check Valve.*

### Slate Roofing.

We recently saw a slate roof which, in its way, was a decided novelty. Each slate exposed its full face to the weather on a flat roof having a pitch of only ½ inch to the foot. It was laid in cement, and had been on for five or six years. The cement was the invention of Mr. C. C. Post, of Burlington, Vt. It consists of coal tar (the liquid and not the solid article), thickened with cement, or, better still, a little ground slate, slaked lime and linseed oil. The proportions were made according to the judgment and the requirements of the material. It was heated until liquid, poured on the roof and the slate bedded in it. The joints were then payed, and the roof was finished. The main bulk of the compound is tar and cement or tar and ground slate. When of just the right thickness, the compound sticks with extreme tenacity to the slate, and cannot be detached without violence. The cost of such a roof is, we believe, at the present time, less than that of tin, and on account of the greater surface exposed to the weather, is considerably cheaper than slate. The compound has not been patented. The advantages of a roof of this character are so great that it would seem advisable for builders to experiment, with a view to asceraining its value.

### Ash Shute.

Messrs. Abendroth Brothers, Nos. 109 and 111 Beekman street, New York, are offering an improved ash shute, a general view of which is afforded by Fig. 13. The demand for fixtures of this character, especially for use in flats and apartment houses, is very considerable. The objection to shutes of the ordinary character is the dirt and dust attending their use, and the possibility of the flue becoming stopped up. These difficulties are so great with the ordinary form of construction that shutes are very frequently omitted where their use would be a great convenience. The apparatus shown in the engraving, it is claimed by the manufacturers, is free from these objections. By an ingenious feature of construction a portion of the ashes poured into the flue at any time may be retained, acting as a sealing agent, and making the device doubly secure as against dust and stench. The makers claim for the shute that it is absolutely dust-tight, and that with it the choking of flues is an impossibility. Two sizes are made, the smaller one requiring a flue 8 x 8 inches, with 4 inches of brickwork in front of the flue, and the larger requiring a flue 8 x 12 inches, with same thickness of front wall.

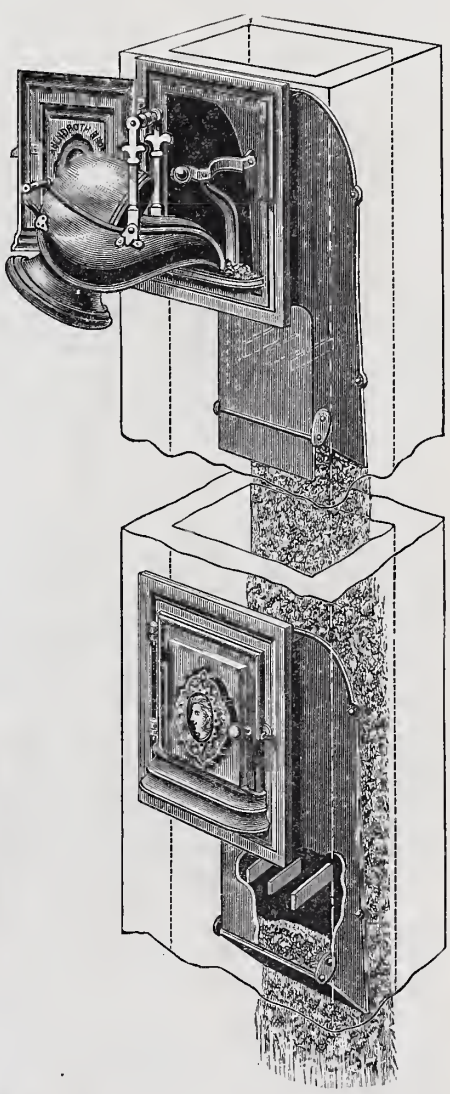


*Fig. 15.—New Ash Shute.*

## NOTES AND COMMENTS.

In Mr. Moore's design of a cheap seven-room house, which we publish in this issue, two designs for chimney tops are shown, which, while being somewhat out of the ordinary run as practiced in many parts of the country, are yet very simple and inexpensive in character, and therefore likely to be serviceable to our readers. One or two correspondents who have inquired for designs of chimney tops recently will probable find these desirable for use.

The expediency of using plaster in the exterior finish of houses in the somewhat irregular and trying climate of the United States is raised by a feature of construction employed in the house design shown this month. The question is one worthy of discussion by practical men, and we shall be glad to receive communications upon it. If plaster is to be employed, there is doubtless some choice as to the character of the ingredients used, the manner of applying the plaster and the finish or wash which is employed in completing it. The difference between success or failure sometimes turns on very small matters like these. Those who are opposed to this kind of finish should have good reasons for the faith that is in them, all of which we shall be glad to see

Those of our readers in the furniture or cabinet-making lines of trade who enjoy the quaint and curious combined with the useful may derive some ideas of advantage in their business from the designs of some old furniture by Sheraton, presented in another place in this issue. Although some of them are a century old and were originally intended for use by princes and noblemen, the designs and the principles of construction and operation shown are none the less applicable to the requirements of modern life. In this age of combination furniture and special cabinet work, such specimens from an old master are interesting.

One of the crudest features of the Vermont marble industry, says *Mechanics*, is its apparatus for lifting and handling the blocks of marble. Power was introduced many years ago, but the derrick in its primitive form seems to be the only means for lifting up marble from the quarry and placing it on the bank. These cranes consist of a mast and boom. In the slate quarries, as well as in the marble quarries, cranes are often seen which have a perfect network of guys. As might be imagined, they have been exceedingly dangerous, and accidents without number have happened. In some quarries each guy is made double or treble in order to insure safety, a precaution which seems to be necessary. One of the most promising of young quarry superintendents in the neighborhood of Rutland, recently, by the breaking of a guy, which allowed the mast of the derrick to fall upon him, was killed instantly. The accident was a needless one, and yet just such a one as has happened a thousand times where derricks of this kind are used. A few of the large quarry owners are beginning to understand that better machinery for doing heavy lifting is to be had, and marked improvement has been begun.

A gentleman who recently returned to San Francisco from a visit to Scotland is said to have successfully negotiated the transfer of a large area of California timber lands, for a sum aggregating between $1,500,000 and $1,750,000, to a recently organized corporation in Scotland, known as the California Redwood Company. The purchase embraces land, mills, tugs and other incidental accessories to the general lumber trade. The main object of the new enterprise is to meet the demand that is developing at Eastern and European capitals for fine redwood lumber for interior house finishing and ornamentation. It is only of late that outside attention has been given to the products of the Pacific Coast, and California redwood has rapidly gained favor among those by whom the study of fancy woods is accepted as partaking somewhat of æsthetic character and taste. In the whole world there are no known redwood forests outside of California. Carefully prepared official estimates give the quantity at 25,825,000,000 feet, and this amount is comprised in the coast belt that extends from Humboldt County, just below the Oregon line, down as far south as the Mexican border.

The increasing cost and elegance of lamps for burning kerosene oil is one of the remarkable features of our nineteenth century civilization, especially so when we consider that gas has been and electricity will be a strong rival to oil as an illuminator. Richest porcelain vases mounted in fine brass-work, supplied with the most costly burners, and the whole surmounted with decorated shades of the most expensive sort, form a combination of handicraft which in many cases is disposed of at remarkable figures. One hundred and fifty dollars, it is stated, is not an unusual price for a fine kerosene library lamp, and it must be confessed that the fashion, though expensive, is a very sensible one, especially if the lamp is used both as an ornament and an illuminator. Thousands of very expensive lamps are sold every year, and there are thousands more to follow, for the fashion is not going to die out soon.

Some of the tin-plate houses are at present in what to the trade generally must appear the amusing position of sharp rivalry over the actual weight of coating to each box of plates. The position is amusing, not because there is anything comical in the enterprising presentation of really good plates, but by contrast with their position only a short time ago, when almost every house was earnestly searching for something which, on account of thin coating or for some other reason, it could sell a little cheaper than anything its rivals had found. This strife to obtain the cheapest goods so demoralized the trade that for a time it was almost impossible to obtain good plate, no matter what the willingness to pay for it. The consequent dissatisfaction with tin roofs is known to every builder and architect. Now it seems the tide has turned, and all the leading houses in the trade have in regular stock plates of excellent quality, many of which are sold under a specific guarantee. Some of the houses are in sharp competition with each other as to the actual weight of coating on the plates offered.

A few weeks since *The Metal Worker*, to whose efforts more than to any other cause is due the very satisfactory change in the tin-plate business to which we have alluded, published an editorial article reviewing in some measure the course of the trade in this matter, and mentioning some of the firms which are now offering tin plates of guaranteed quality. Among others the statement was made that Messrs. W. F. Potts & Son, of Philadelphia, claim for their "Old Process Roofing or Terne Plate" that there are 5 pounds more metal to each box of 20 x 28 than any other in the market. This brought a rejoinder from the firm of Gummey, Spering, Ingram & Co., also of Philadelphia, in the form of a letter written to them by the Pontymister Tin Plate Works, near Newport, Monmouthshire, and which they sent for the Editor's perusal. In this letter the statement was made "that there is on the average 19 pounds of metal upon every box of C 14 x 20, and 38 pounds upon every box of C 28 x 20, and there is no terne going into the market that has such a heavy coating." Commenting on this *The Metal Worker* says: "We cannot, of course, pretend to decide between these conflicting claims, but the statements are interesting, all the same, and should command the attention of every consumer. It would seem that no one need hesitate to buy either of these brands, so far as thickness of coating is concerned."

The credit of first putting upon the market "guaranteed tin plates," according to the same authority, seems to belong to the Excelsior Manufacturing Company, of St. Louis, who, several months since, imported some roofing plates, the quality of every sheet of which they guaranteed. Other houses have practically done the same thing, but have reached the result in a different manner. Some of them have laid special stress upon the brands employed, these being special trade-marks under their control, and others have used different words or phrases, the meaning of which, however, is equivalent to that of "guaranteed." This last term was the watchword employed by *The Metal Worker* in its crusade against inferior goods and in favor of honest practices in the tin-plate trade. Hence it has a peculiar significance in this connection.

The present very satisfactory condition of the tin-plate trade, so far as quality of goods is concerned, has been reached by a number of distinct steps or stages. The first evil combated was that of "wild-cat" brands—names applied to plates only for the purpose of selling them, and conveying no idea of their quality, being used for the most part for the purpose of obtaining a little higher figure than could be got if the goods were sold strictly on their merits. The best work at this point was done by Messrs. Merchant & Co., of Philadelphia, who, very early in the campaign, hoisted the motto of "nothing but makers' brands of established reputation." They were the first to give builders the opportunity of buying what they really wanted, and relieving them of the perplexities and deceits of "wild-cat" brands. The business which this house has established upon this basis has been a very good one, and is constantly growing.

N. & G. Taylor Co., of Philadelphia, have for a long time been selling their own brands of tin plates in a way which is practically equivalent to guaranteeing. They have carefully studied the wants of each different class who use tin plates, and they have brought out articles calculated exactly to meet those wants. Thus, they have special goods adapted to the requirements of manufacturers of fine tinware, and others adapted to roofing purposes, the quality of which is carefully set forth in their advertisements, and to maintain which the reputation of the house is pledged. A circular recently issued by this firm, and addressed to "Architects, Builders and Carpenters," entitled, "Do You Get What You Specify?" covers the ground very satisfactorily, and shows those who have charge of buildings at least one way in which to secure good roofing material. This house goes a step further and offers to send, free of expense, samples of the plates it proposes to furnish—a guarantee of good faith which many will appreciate.

During the time that tin plates have been under a ban, and poor tin roofs have been the rule, not from choice on the part of the tinners who have laid them, but because of the difficulty of procuring really good plates, many architects and builders have become so thoroughly disgusted that they have, so far as possible, specified other material, and have avoided tin for roofing purposes almost as they would avoid quicksand for foundations. They have probably done wisely for their clients and their own reputations in so acting, but still it has been a great inconvenience many times to get along without that useful material. The fact that good plates are once more in the market, and that roofs laid of the best plates that can be made are now to be had, with proper care, in every section of the country, is of no small importance to builders generally. The mere announcement ought to cause a largely-increased demand, for the discrimination against the use of tin plate in building construction solely on account of poor quality and unreliability has been widespread.

Many mechanics have a fondness for building their own tools, even when quite as good can be bought at a reasonable price. Sometimes this arises from a false notion of economy, the assumption being that anything homemade must be cheap. In other cases, it arises from a disposition never to be satisfied with anything which some one else has built. In many instances, however, it has for its foundation a commendable desire to possess tools of really excellent quality, and which, at the same time, are the result of the skill and industry of the owner. Amateurs build their own tools for the satisfaction derived from the mere performance

of the work, and for the experience in the mechanical arts to be thus gained. It will be from one or another of these reasons that various persons among our readers will be interested in the description of lathe construction which appears upon another page.

Considered from a purely economical standpoint, we do not think any mechanic, in this country at least, can afford at the present time to build a lathe of the general kind shown in the article referred to. Among the numerous tools now in the market, wide range of choice is possible, and there is hardly a reasonable requirement in such a tool which is not filled by some manufacturer. On the other hand, among the great number of apprentices and amateurs in the country at large there are many whose best interests will be served by first building such a tool and afterward learn to work upon it. For all such our article on page 246 has special interest and value.

One of the most interesting experiments in the way of industrial or practical education is the enterprise known as the New York Trade School, an institution founded through the munificence of Mr. A. T. Auchmuty, and which has now been in operation a little over two years. The school reopened for its third season, under the most favorable auspices, on the 5th ult. Evening classes for instruction in various trades will be held on Monday, Wednesday and Friday evenings until April next. The branches to be taught embrace bricklaying, stone-cutting, fresco painting, plastering, pattern making, turning, wood carving and plumbing. The new workshop at Sixty-eighth street and First avenue, which was built last spring by the class in bricklaying, will be used this year. Two hundred students have been enrolled for the present season. The good work that this school is accomplishing will be a monument to its founder and promoter, more enduring than brass.

The best means of recording the cost of work in building operations is a very important question, whether considered by the contractor, for the purpose of having the details of his business always available for reference, or by his bookkeeper, who is called upon to devise ways and means of accomplishing the results his principal desires. The end in view is not simply the cost of a certain building in lump, but, rather, the cost of each separate part in detail, since this alone will afford the requisite data for reveiwing estimates on similar work. After some satisfactory plan of analyzing the building has been hit upon, and it has been resolved into its component parts, such as framing, floors, windows, stairs and the like, the different kinds of work entering into each demand consideration, and this shows at once what a complicated problem the whole thing is.

Perhaps no better plan has ever been devised than that of order and record slips. These are blanks, properly ruled, with column headings printed, in order to facilitate the records which are to be put upon them, as well as to systematize the work of recording. All orders for doing work are issued by means of one of these blanks, and when the work has been done the slip is returned to the foreman or bookkeeper, as the case may be, with full particulars of material used and labor employed. The advantage of slips over books is in the fact that the former admits of any required division and the employment of as many different foremen in one general department as may be desired, and each entirely independent of the others, while the other remains a unit and is practically restricted to one set of men under one foreman. The slips return to the office for calculation and filing as fast as they are filled, while a book would of necessity remain out until the last item was finished.

At Cleveland, Ohio, recently, we had the pleasure of examining some parts of such a system of recording cost as we have just mentioned, in the establishment of Mr. A. McAllister, one of the leading contractors and builders of that city, and a gentleman whose accuracy in matters of estimating is well known in the circle in which he moves. The system, which was very intelligently explained by his superintendent, Mr. J. B. Shengle, is too extended to permit of a complete outline in this connection, but we can describe some of the blanks employed, from which our readers will be able to judge of the utility of a similar method applied to their own business.

The time of the workmen employed outside of the shop is recorded by the several foremen upon blank slips, called, "Daily Time Sheets," which, when filled up, give the name of the job upon which the men are employed, the names of the workmen, and, in columns opposite, the hours of time made each day, and the kind of work done. The record of work done in the shop is kept upon similar blanks, which, however, are ruled for fortnightly returns instead of daily, the men being paid every two weeks, and this form of record facilitating the calculation of the amounts due them. In both cases the results are the same. The return of the slips to the office shows to what particular piece of work each hour of time paid for is to be charged, the correctness of the entry being attested by the signature of the foreman in charge. A very simple system of bookkeeping, in view of such data, is sufficient to show the cost of every part of a contract.

Materials used in the construction of work are also ordered upon appropriate blanks, which are ruled to record the stuff required in detail, together with the name of the job it is for, the name of the workman by whom it is cut, and the "Hours of Machine Time" consumed in redueing it to the required shape. By this means the same record of material is obtained for use in the office for calculating exact cost as with the labor already mentioned. Still other blanks in use in Mr. McAllister's establishment might be mentioned, but enough has been presented to show the prineiples underlying the plan.

The advantages following any adequate method of this general kind can scarcely be exaggerated. The evils of guesswork and uncertain estimates are entirely overceme, if no other good is accomplished. With such records of actual cost as we have described, based upon an intelligent analysis of the work in hand, by which it is separated into just those parts or structures which will finally constitute it in its entirety when they are assembled and properly joined, and with the original estimate upon the same work based upon a similar analysis before him for comparison and criticism, it becomes a very simple matter for the builder to reduce the work of calculating cost in advance of performing the work to a definite and reliable system. The general absence of careful work of this kind accounts for the unreliability of builders' estimates, and explains why many of them fail on their contracts, casting discredit upon the entire craft.

Our novelty department this month is very full of interesting specialties, ranging from an improved sandpapering machine to a new hasp lock. The conveniences for doing work and the new ideas for trimming and finishing buildings that are constantly being brought out by manufacturers are more numerous than any one who does not study such things would ever imagine. Our readers, through this feature of the paper, are kept informed of the general progress in such matters, and by perusal of our articles from month to month have the opportunity of keeping their chests supplied with the latest and best special tools, and of using upon the buildings under their charge the latest novelties in fittings, besides adding to the machinery in their establishments the latest labor-saving devices. Our advertising columns keep manufacturers' names before our readers, so that they are constantly reminded of whom to order when in want of any of the articles we have described, as well as other goods, even though the paper in which the editorial description appeared has been mislaid. Our selection of "Novelties" is always made with special reference to the wants of our readers.

## NEW PUBLICATIONS.

BUILDING SUPERINTENDENCE. A Manual for young architects, students and others interested in Building Operations as carried on at the present day. By T. M. Clark. Size, 5⅛ x 8¼ inches, 336 pages, bound in cloth, illustrated. Published by James R. Osgood & Co. Price, $3.

This work, which was originally published as a series of articles in the *American Architect and Building News*, the author defines as a simple exposition of the ordinary practice of building in this country, with suggestions for supervising such work efficiently. While by its title it would seem to be of the greatest interest to architects and professional superintendents, it has much in it that is of great value to carpenters and other mechanics in the building trades, and especially to students of architecture. The general divisions of the book are as follows: "The Construction of a Stone Church," "A Wooden Dwelling," "A Model Specification," "Contracts," and "Construction of a Town Hall." In the first two items and the last every detail of work in connection with the buildings mentioned that requires explanation and description has been carefully treated. While we take exception to some of the advice given by Mr. Clark and some conclusions reached, in the main the work is to be be commended as the best exposition of building practice that is now before the reading public. The book is handsomely printed on good paper, but its otherwise fair face is somewhat marred by illustrations which have rough, irregular and broken lines. They are, however, for the most part sufficiently clear to leave in the minds of the readers no doubt as to the meaning of the author.

THE ARCHITECT AND BUILDERS' POCKET COMPANION AND PRICE BOOK. By Frank W. Vogdes. New edition, enlarged, revised and corrected. Size, 3½ x 5½ inches, 362 pages, pocket form, gilt edges. Published by Henry Cary Baird & Co. Price, $2.

The new edition of the pocket-book containing tables and memoranda of special usefulness to architects and builders, and which, in the time it has been before the public, has been sold to the extent of some 10,000 copies, is a matter of general interest. Mr. Vogdes is a practical architect and a man who has been indefatigable in investigating those matters which are of general interest to all having occasion to make calculations connected with building operations. He has gathered in this work a selection of engineering and mechanical tables which are the most useful to those classes for which the book is intended. In the new volume some errors which existed in the old have been corrected, and many important additions have been made. The work has been expanded and revised in general, so as to bring it up to the requirements of the present day. From a casual examination we think it is likely to be even more popular in the future than it has been in the past.

STEAM HEATING. An exposition of American practice of warming buildings by steam. By Robert Briggs. Van Nostrand's Science Series. Size, 6 x 3½ inches, 108 pages. Price 50 cents.

This is a reprint nearly in full of a paper by the late Robert Briggs, read before the British Association, on the subject of steam heating as practiced in America. While much of the matter is purely technical and of value only to steam engineers, there are portions which are of general interest to the architect and builder who desires to become familiar with the principles underlying this important method of heating and ventilating buildings. The same matter that is contained in this volume has also been published in full in the form of a serial in the current volume of *Mechanics*.

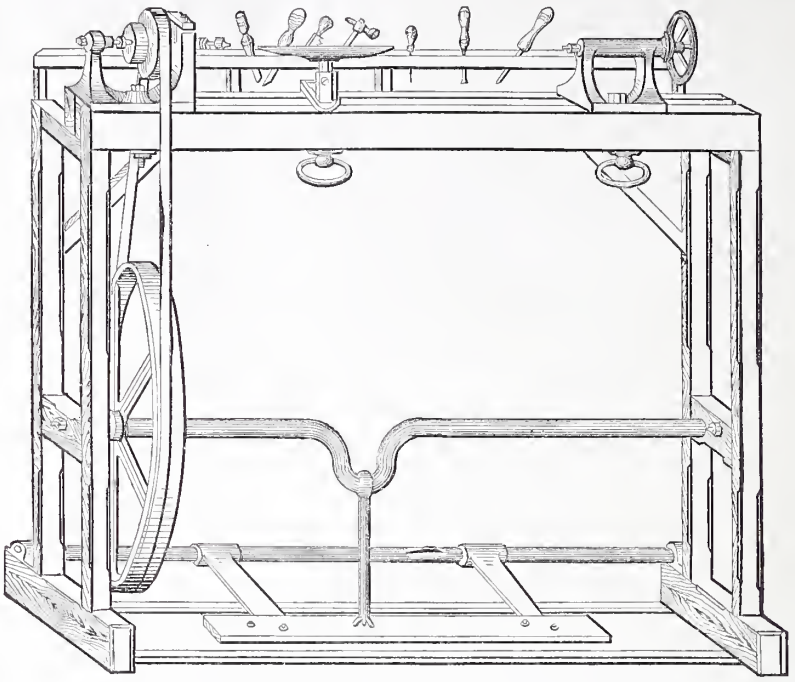
PRACTICAL TREATISE ON LIGHTNING PROTECTION. By Henry Spang. Size, 7½ x 5 inches, 63 pages, illustrated, bound in cloth. Published by D. Van Nostrand. Price, $1.50.

This is a new edition of a work first issued in April, 1877, and it is said by the author to contain more complete and explicit directions for applying lightning conductors than were in the former work. The author has had a practical experience of something like 20 years in the electrical business, and has made the subject of lightning protection a specialty. He commences the work by a consideration of electricity and its action,

and follows with other appropriate chapters, among which may be mentioned "Electric Induction" and "The Formation of Thunder Clouds and Storms," and "The Origin and Principal Functions of a Lightning Conductor." Ho finally reaches the subject matter of his work, and introduces what he terms the radial system of lightning conductors. The author's idea may be gained from a brief extract: "To proporly protect every part of a building it is necessary to employ a radial system of metallic conductors, which will enable the electricity concentrated in the earth from all directions to unite with that from the clouds by different paths about the building, thereby preventing an excessive flow over or through any portion of the building." The system is carefully explained by a number of illustrations and several pages of letter-pross. Careful directions are given with reference to the terminal points of lightuing-rods. The author lays special stress upon the necessity of a moist-earth terminal, and shows one or two ingenious plans by which he has been enabled to secure the same. Oue chapter is devoted to the exposure of humbugs in this line of investigation, and the book closes with numerous testimonials both as to the author's ability and the satisfaction experienced with the system he advocates.

## Construction of a Lathe.

At frequent intervals we receive letters asking for advice iu the construction of turning lathes for amateur use. We have already published descriptions of one or two tools of this kind employed by some of our readers, but evidently a want exists which has not as yet beeu fully filled. We propose, therefore, presenting an account of a lathe in use by an English amateur, which shall show in detail how tho parts were made, from the construction of the patterns to the finished tool. The directions will be sufficient for any one moderately skilled in the use of tools to construct a serviceable lathe capable of doing wood or metal work at pleasure, and one which may be used alike on rough woodwork and fine metal turning. Fig. 1 shows the general appearance of the lathe in question, as well as the relative proportions of its parts. It possesses strength, lightness of motion and fair capacity, being neither a toy on the one hand, nor unwieldly on the other. It is suited to the requirements of the wood-turner and pattern-maker, the amateur electrician and student of mechanics who wishes to construct his own apparatus and models, as well as for home amusement, the making of fancy articles, furniture, repairs and so forth. It has wood standards and a wooden bed. The poppets—5-inch centers—are of cast iron. The headstock has a wooden rigger to receive a strap, and the mandrel runs in parallel brass bearings—not so good, of course, as conical steel bushed bearings, but good enough for ordinary work, and much easier for the amateur to fit up. Tho movable poppet carries a hollow mandrel, traversed by an internal screw (the neatest method), and the dead center is removable at pleasure, to allow of a drill plate being slipped over the mandrel nose. The driving-wheel is of cast iron, and the crank is of wrought iron throughout, case-hardened at the ends, where it runs on steel centers. The bed is 4 feet long and stands 3 feet 3 inches high. There is a T woodturning, and a slide-rest, besides various chucks.



*The Construction of a Lathe.—Fig. 1.—General View of the Lathe, Showing Relative Proportions of Parts.—Approximate Scale, 1 Inch to the Foot.*

We will assume that in the construction of of this lathe the builder desires to do as much as possible himself, either from motives of economy, for practice in use of tools and performance of work, or for the sake of having a lathe resulting entirely from his own labor and skill. The patterns, then, are tho first consideration. The material in them is so small that its cost need hardly be considered. Almost any odds and ends of stuff, to be found around all woodworkiug shops, can be made available.

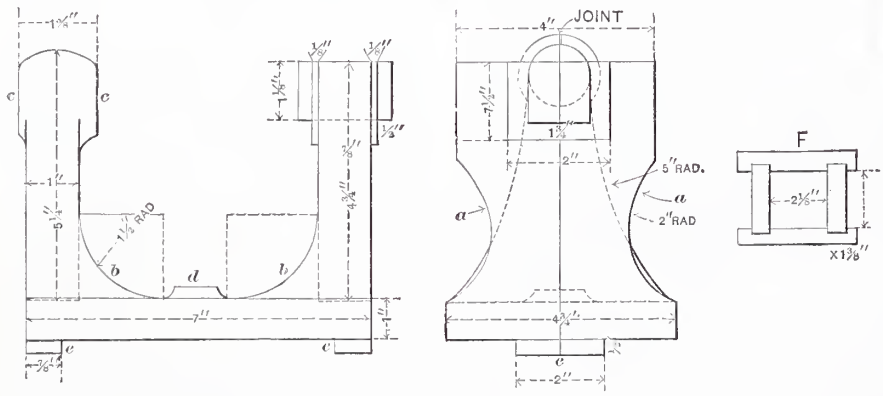



*Fig. 2.—Detail of Headstock.—Scale, 3 Inches to the Foot.*

Fig 2 represents the headstock; Fig. 3, the poppet. Both headstock and poppet will be jointed longitudinally, not because that is the only way to make them, but because it is as good as any other in the present instance. For the headstock, then, get out two pieces for the foot, finished to 7 by 2⅜ inches by 1 inch, and dowel them together by corresponding edges. Also two pieces for the front of the headstock 4¾ by 2 inches by ⅞ inch; connect with one dowel, and cut out the curved portions *a a*, to relieve the heavy appearance which would be produced by the upper portion (enlarged for the reception of the screws of the cap) being continued straight down to the base. Prepare two pieces for the hinder portion of the headstock, 5¼ by 2 inchos by 1 inch, connect with one dowel and cut curve and boss as drawn. Rebate the foot to a distance from each end equal to the thicknesses of the front and back, and to ⅛ inch below its face. Screw front and back into their respective rebated recesses, being assured that they stand at right angles with the base. Into the inner angles glue square blocks, *b b*, indicated by dotted lines, and when dry strike out and work 2-inch radii with gouge and round plane. The boss for the back center will be thickened up with two thin facings, *c c*, turned and sawed in half with a dovetailed saw and fastened one on each face.

The facings for the mandrel bearing will be prepared, four pieces, 1½ inches by 1 inch by ⅛ inch, and fastened in position. Two prints, also in halves, requiring four pieces 1⅛ inches by $\frac{11}{16}$ inch by ½ inch bradded upon the facings. The boss for the tightening bolt *d*, and the guide-pieces *e*, each in halves, will complete the pattern, save that the sharp edges should be taken off all round the upper portions to a $\frac{3}{16}$-inch radius, to aid in giving a graceful outline to the casting. The core-box F is made to the dimensions over the

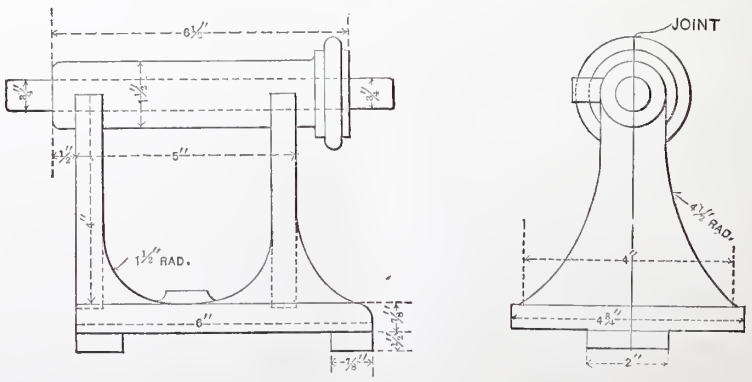


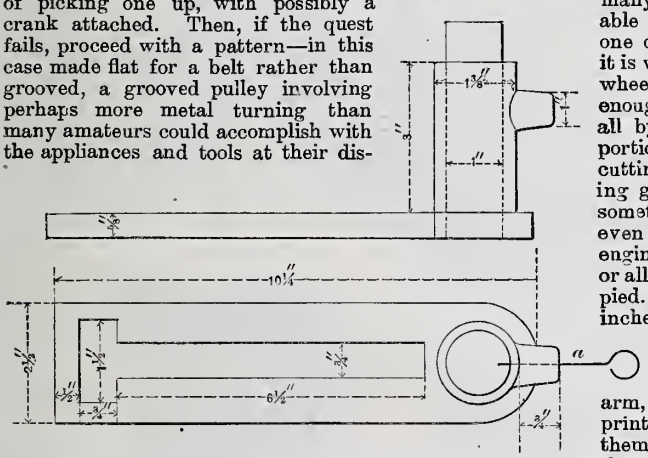

*Fig. 3.—Details of Poppet or Tailstock.—Scale, 3 Inches to the Foot.*

prints. No hole should be cast for the tightening screw, nor for the reception of the back center.

We will make the poppet, Fig. 3, similarly. It is as often, however, made without the longitudinal joint, the barrel being turned solid and jointed loosely to the ends. Two pieces for the base, 6 inches by 2⅜ inches by ⅞ inch; two for each end, 4 inches by 2 inches by ⅝ inch, cut out to radii given, the barrel turned in halves to figured dimensions and notched to fit on the ends. Boss for tightening bolt and also for set-screws will be required for this pattern. Work the hollows *b b* as in the headstock, fasten on the guide-pieces, and round the edges as before. In making these patterns, it is better to give a shade of taper in the direction of their draw, just a couple of shavings, say, thinner on the down side than on that next the joint, to aid in their withdrawal from the sand. This, which is very important in patterns having a deep lift, is often neglected, however, in these smaller ones, the rapping alone usually being sufficient to insure easy delivery.

For the rest, prepare the base to dimensions given (Fig. 4), cutting out the slot in the pattern to deliver itself. Turn the socket with a long print on the end, and secure to the base with a stud. Put on the boss for the tightening screw loosely with a wire, *a*. For the T-piece (Fig. 10), prepare a piece of stuff 10 inches by 1½ inches by ½ inch, and work to shape, half-sized sections being given at middle and e. ds A A, the shank being turned and fastened to this. The hand-wheel, Fig. 5, can be cut out of a solid piece of hardwood, exactly like the casting, to dimensions given.

In reference to the driving-wheel, it will be advisable, first of all, to have a look into the second-hand dealers' shops for the chance of picking one up, with possibly a crank attached. Then, if the quest fails, proceed with a pattern—in this case made flat for a belt rather than grooved, a grooved pulley involving perhaps more metal turning than many amateurs could accomplish with the appliances and tools at their disposal. Build and glue up three courses of segments out of, we will say, the four of which the rim is to be composed. When built up, turn their inside diameter to finished size. Leaving the partly-made rim for a while,




*The Construction of a Lathe.—Fig. 4.—Details of Rest.—Scale, 3 Inches to the Foot.*

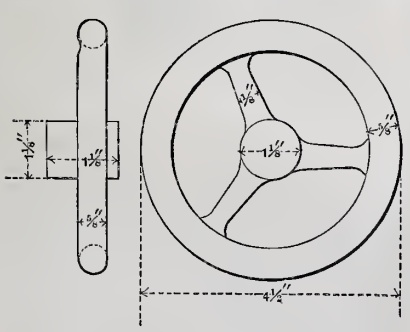



*Fig. 5.—Details of Hand-Wheel.*

plane up three strips of stuff 1 foot 11 inches by 2½ inches by ¾ inch for the arms, and lock them together. On these pieces so locked together mark out the six arms to dimensions given, leaving the portions which are to be let into the rim the 2½ inches wide to include the radii. Now, returning to the rim, recess it in six places to dimensions corresponding with those at the ends of the arms, and drop the latter into the spaces thus prepared. Lastly, over the ends glue up the last course of segments and complete the turning of the wheel.

This assumes the use of a lathe large enough to take 23 inches diameter, and, as many persons might not be able to obtain the loan of one of so large a capacity, it is well to mention that the wheel can be made well enough without a lathe at all by striking the circular portions with trammels, and cutting carefully with paring gouge and chisel, as is sometimes done at a push, even in workshops, if the engine happens to be stopped or all the lathes are preoccupied. Turn two bosses 2½ inches diameter by 1¼ inches thick, and fasten them, one on each side of the wheel arm, putting a 1-inch core print on the center of one of them; round the edges of the arms, and put on double ribs to give rigidity and elegance of appearance.

There will be a cap for the headstock to dimensions, Fig. 7, having facings corresponding with those on the headstock; also a couple of small castings, as Fig. 8, for the treadle bar. We shall want also a pattern for the brasses, Fig. 9. For this cut a bit of wood 1½ by 1 inch by ¾ inch, also two thin pieces 1⅞ by 1 inch by $\frac{6}{16}$ inch. Brad these latter on the first piece as indicated, and cut out the bearing to ¾ inch. Not to be bothered with too many matters of detail at one time, and being, moreover, anxious to see some of our metal work under way, we will get these, the chief, parts cast at once, and give our attention to chucks, side-rest and minor matters afterward. Now, what about expense? The headstock and poppet will together weigh 30 pounds,

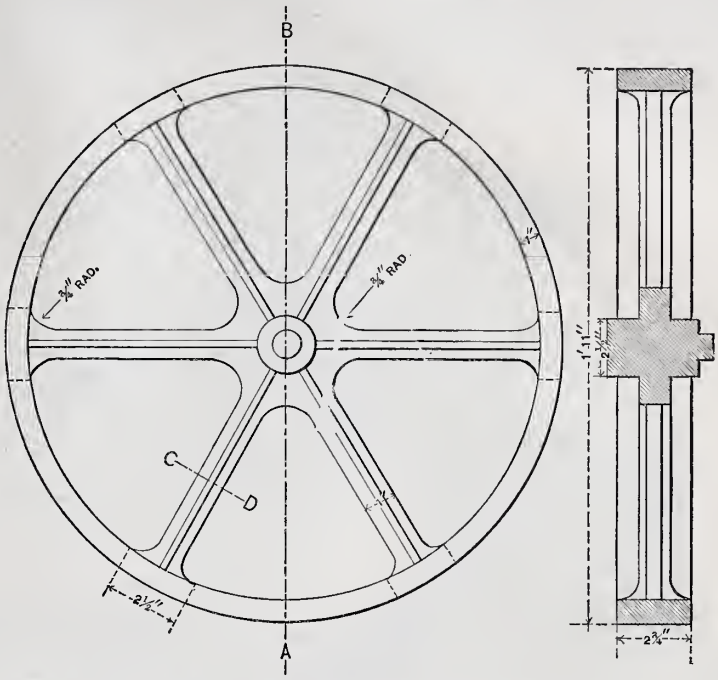



*Fig. 6.—Details of Driving-Wheel.—Scale, 1½ Inches to the Foot.*

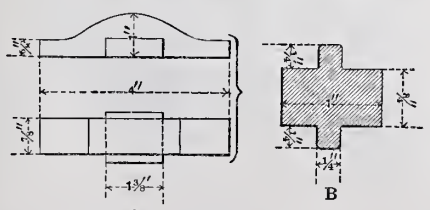
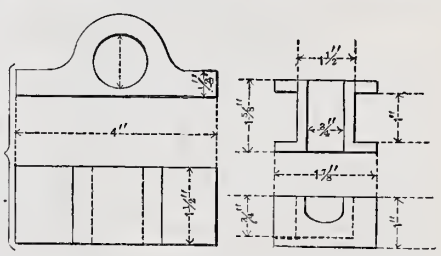



*Fig. 7.—A, Cap for Headstock.—B, Section C, D, in Fig. 6, Half-Full Size.*

the fly-wheel 70, and the rest, with the other castings, 10 pounds; total, 110 pounds. The prices at which such castings can be got will depend very much upon locality, and we leave our readers to ascertain from the job foundries in the neighborhood rather than name figures here, which, in any case,




*Figs. 8 and 9.—Castings for Treadle Bar and Brasses.*

would have to be verified. There is also to be considered the cost of the two brass bearings, which will weigh about a pound.

A permanent exposition of building arts and appliances is proposed at Chicago. The scheme is to make the exposition free to the public every day of the year, Sundays and holidays excepted. We understand that a building containing all necessary conveniences has been secured. This enterprise is in the hands of Mr. Henry Lord Gay, No. 80 La Salle street.

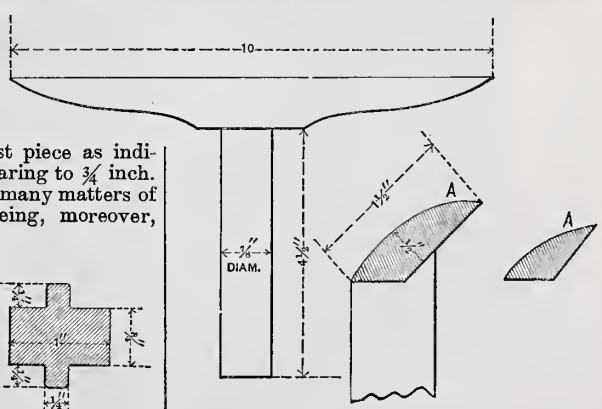
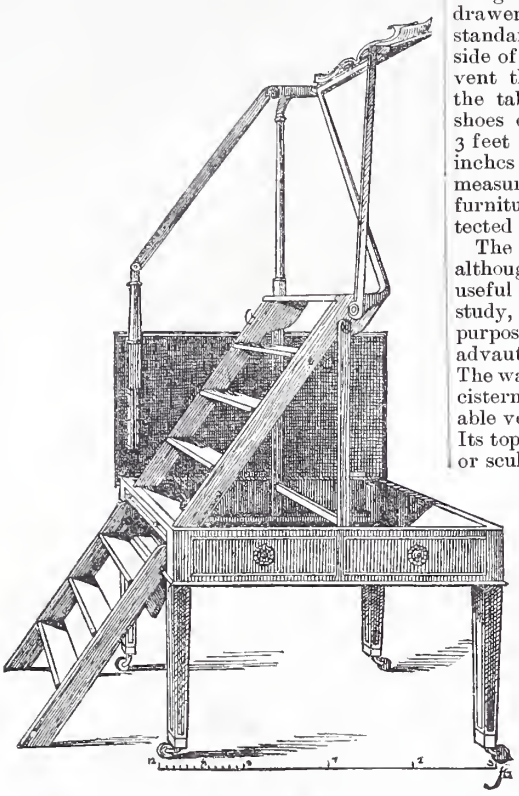



*Fig. 10.—Details of T-Piece of Side-Rest.—Scale, 3 Inches to the Foot.*

## Some Odd but Useful Furniture.

The accompanying designs show some very useful pieces of everyday furniture not commonly found in the stores, although the present is the age of combination goods and odd pieces. They are all from drawings by the celebrated English designer Sheraton.



*Some Odd But Useful Furniture.—Fig. 1.—A Combination Table and Reference Desk.*

Each piece seems to answer its purpose fully without any endeavor after display or peculiar fancy. This furniture was designed for use among the English nobility and the royal family, yet some of the ideas suggested will be found useful in whole or in part in democratic America. The following description is from the columns of a London contemporary :

The combination steps and reference desk for a library, Fig. 1, were executed to the order of Mr. Campbell, upholsterer to the Prince of Wales, and were first made for King George III, who is said to have used and highly approved of them. The whole thing is made to fold at once into the table to which it is attached. The size of the table is 3 feet 10 inches long by 2 feet 9 inches high, and 2 feet 1 inch in width. When the steps are out they rise 33 inches above the top of the table frame, and the total hight of the last step is 5 feet 5 inches from the ground. The hand-rail is 3 feet 1 inch above the last step, and the desk or book-rest is constructed of iron, made to stand so firmly that a book may be referred to or a passage copied without obliging the user to descend into the room. To fold up the steps the following method has to be adopted : Unlock the book-bracket, which is fixed by a catch at the end of the hand-rail, turn the flap over to the inside, and the whole comes forward and lies level upon the upper steps. The longer standard may then be lifted out of its socket, and, having a joint at its upper end, turns up level with the hand-rail. The short standard is then, by relieving a spring, pressed down below the edge of the table top, and the hand-rail with the long standard having been folded together as described, they both rest on an iron socket fastened to the front edge of the upper steps, as shown. The supporting frame or horse is then folded by the side of the upper steps, when they and the whole contrivance fall down within the table frame. The lower set of steps can now be turned up to a horizontal position, and, being hinged to a slider which runs in a groove, slips in as a drawer and is inclosed by the flap, which turns up and appears as the front of a drawer. When the steps are not in use the table is furnished with a desk for writing purposes.

A similar, but more simple, arrangement of steps is shown in combination with a Pembroke table, Fig. 3. Here the upper flight turns down upon the under one ; both flights then rise up and slide into the drawer space, being inclosed, as before, with a fall-down drawer-fronted flap. The post and hand-standards are hinged, and so fold up by the side of the top steps, while, in order to prevent the legs of the horse from scratching the table top, their feet are shod with felt shoes or wads. The length of the table is 3 feet 6 inches by 22 inches wide. It is 30 inches high, and the steps, in total hight, measure 5 feet. At the time these pieces of furniture were made (1793) they were protected under a patent.

The corner cabinet washstand, Fig. 4, although elegant in its outlines, is simply a useful cabinet, well adapted to an office or study, and, without protruding its precise purpose, which in such a case is a distinct advantage, admirably fulfills its intentions. The water supply is drawn from a lead-lined cistern, and after use is received by a movable vessel contained in the lower chamber. Its top its adapted for the display of a vase or sculptured bust.

Another piece of library furniture is the writing cabinet and secretary, Fig. 7, so contrived as to be used either sitting down or in a standing posture. The secretary drawer is adjusted for the first position, and is provided with a series of useful pigeon-holes and drawers. Being intended for the use of an architect, the lower body of the piece is fitted with deep drawers for drawing papers and plans, together with tee-squares and straight-edges. The table top is specially contrived for drawing purposes, while the semi-circular ends extending beyond the rising desk afford suitable space for drawing instruments and color boxes ; two drawers occur below these shelves, and give ready accommodation for materials not in use ; below these at either end are more drawers, with four cupboards, all being triangular on plan, but nevertheless very useful for upright articles. Beyond the paper drawers on the reverse side are a series of book-shelves, completing a combination of utility seldom found in one piece of furniture. The piece is made in two parts, the joint being at the secretary slide level.

Fig. 5 shows an elegant table, "found highly useful to such as draw." It was designed by Sheraton for his own fancy use,

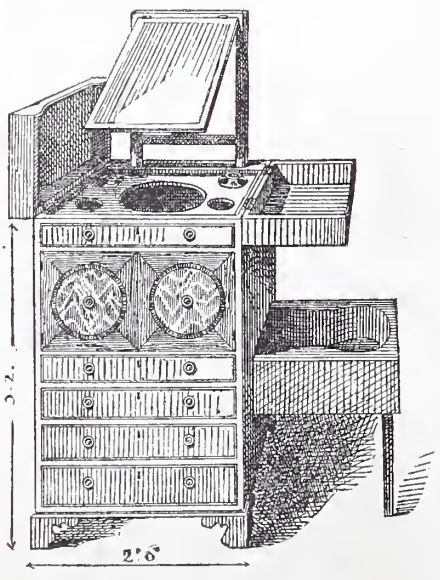



*Fig. 2.—A Bidet Dressing-Table.*

but perhaps is more suitable for drawing-room purposes than for the hard everyday work of a designer. A diagram section shows how the upper portion is regulated and adjusted by a double horse, and besides this contrivance, for model drawing or when studies are made from nature, a flap bracket is provided with much ingenuity on the upper edge of the drawing desk, so that any object, such as a vase or flower-pot, may stand level. The sliders at either end afford accommodation for drawing instruments, candle or lamp, &c. The long drawer is deep and broad enough for Whatman's sheets of drawing paper, and the side drawers, forming the "knee hole," are fitted up for colors.

The bidet dressing-table, Fig. 2, at once bespoaks its several useful purposes, with its

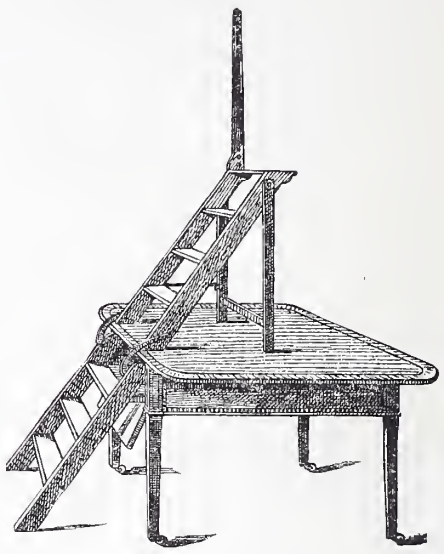


*Fig. 3.—Pembroke Table and Library Steps.*

sunk water-bottles, sliding up looking-glass, folding flaps and useful cupboard, while the same remark equally applies to the night-table basin stand, also illustrated (Fig. 9). Both are practical pieces of furniture, intended for emergencies as well as for daily use, and, without any claim of beauty, perform their purposes in a modest and unaffected manner, which is more than can often be said of recent specimens of their kind. The gouty stool, Fig. 8, if not so

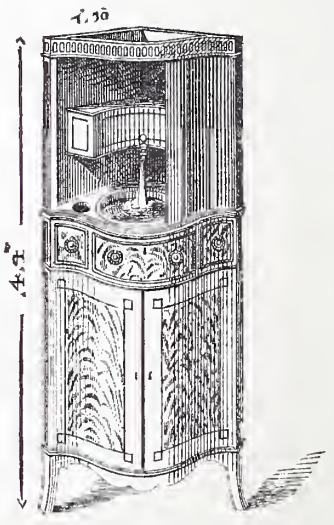


*Fig. 4.—Corner Cabinet Washstand.*

much needed nowadays as in the port wine drinking times of George III, is certainly not a disused or unnecessary article. The upper part is furnished with a stuffed squab, covered with horsehair, and its level or inclination can be adjusted to almost any angle to suit the wants of the patient, while the whole thing stands well, square and firm.

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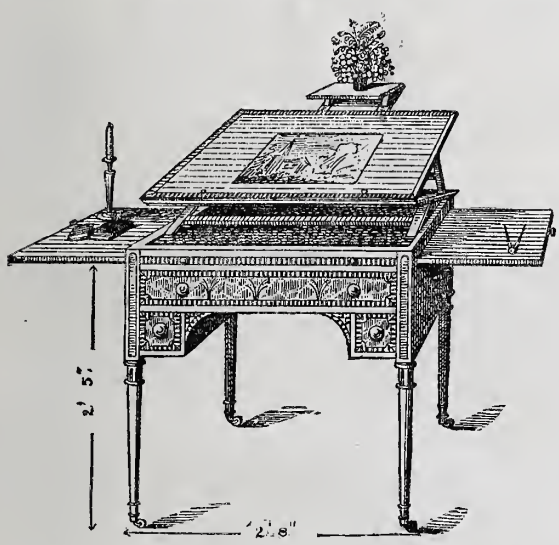
Near the close of the eighth century, Charlemagne ordered the constructiou, over the Rhine, of a bridge resting on 28 buttresses. The bridge was struck by lightning and burned to the water's edge. German engineers are removing the remains of the old structure. They have already taken out 50 piles, with the lengths of 5 or 6 meters (5.468

to 6.562 yards). The wood, which is nearly 1100 years old, is so well preserved that it can still be used in building, and the iron, which was riveted to the posts, can also be used.

## Dowel-Making and Doweling.

The method of putting things together by means of dowels, or doweling, as it is termed, is one of the utmost importance, and is required in some part or other of nearly all articles of furniture. A writer in the *Building News* describes the manner of making them, and gives a few directions for their use:

For making dowels you must select a strong and tough wood. The best for the purpose is beech, although oak or walnut will answer very well for some purposes. It must be straight grained, as straight as you can possibly obtain it, and thoroughly dry. The dowels are made in various sizes. Those most generally in use are ⅛, ¼, ⅜ and ½ inch diameter, according to requirements, a size very nearly ¼ inch diameter (about that of an ordinary lead pencil) being very useful. You must purchase or make a dowel-plate. They are sold with holes in them for making three or four different sizes, but it is not a very difficult matter to make one out of a piece of iron ⅛ inch or so thick by punching a hole in it and enlarging it to the size you require. You will want a brace and the necessary bits to




*Some Odd But Useful Furniture.—Fig. 5.—Drawing-Table.*

correspond with the plate holes; now, mark your wood out; about 10 or 11 inch lengths are the most handy to work, and the width should be rather more than the diameter you intend the dowel to be. Having cut out the lengths, plane them up square; then take off each corner of the square with the plane, so as to get them to correspond nearly with the holes. The best way to do this, which is rather an awkward job, is the following: Get a piece of pine ¾ inch thick, 2½ or 3 inches wide, and about 2 inches longer than your dowel lengths; straighten one edge of it and mark a ¼-inch margin each side upon it; from this cut inwardly on the bevel to the depth of ¼ or ⅜ inch. This will give you a V-shaped groove. You may cut it out throughout its length, and put a screw or pin in one end to form a stop; but it is better to leave ½ inch square at one end, and to cut the groove the remainder of length. This place in the screw-bench, and you will find your length will lie in it while you plane off the corners; you can then reverse and proceed until all are completed. It is necessary to take a little more—about two or three shavings—off one corner, it is immaterial which, than off

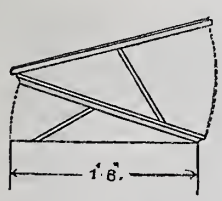



*Fig. 6.—Sectional View of Drawing-Table.*

the remainder. I shall explain the reason for this presently. Having done this, take the dowel-plate. You will notice that the holes on one side of it are larger around the apertures than the other; rest it, with this side upward, upon the bench over a hole, underneath the one you intend using, and drive the lengths steadily through. You must commence carefully, holding the length with the left hand near the bottom, while you tap it gently with the hammer with the right until you get it fairly entered. Then go on more firmly. When you have driven it through rather more than the thickness of the bench, you will find it better to hold the length from the underneath side, as this will prevent the plate from jarring. The lengths should not go through without a moderate amount of driving force, and, on the other hand, they must not require too much, or they will be likely to break without going through. A little practice will familiarize you with this; but it is better at first to use your lengths a little shorter than I have previously recommended, and you will be less likely to break them. You must take care to keep them as upright as possible, and hit them fairly on the top. When made, they should, when looked at endways, or in section anywhere, be circular in appearance and fit the plate hole tightly, with the exception of that portion where the additional amount was taken off the square corner, which should now appear a trifle off.

Before doweling anything it is necessary that the various parts intended to be secured by this method should first be fitted exactly in the position they are to ultimately remain in. Suppose, for example, we have the head of a desk, the top of a cabinet or anything of a similar nature we wish to dowel It is first accurately fitted and placed in position. Now, take a marking awl and mark lightly—a small mark ⅛ inch long is sufficient—on the outside edge of the carcase, one or two or as many points as you require dowels. You must, of course, be guarded by the requirements of your work; a distance of from 4 inches to 6 inches apart generally answers very well, but use sufficient to make it quite secure. When marking these points on the carcase, mark the top to correspond at the same time, by simply drawing the awl upward and marking it on its underneath side, taking care that it does not move or shift at all while marking. Then gauge on each, setting the gauge so that it will mark in such a position that you can bore with safety, not too near the edge or where there is any likelihood of splitting anything. From the previous markings draw a line at right angles to the gauged mark until it meets it. This is done by running a square along it. The points where these two lines meet will be those for the center of the dowel and its corresponding hole. In some cases you will easily be able to find examples. We can obtain the position in this way: Take the piece of work to be doweled and consider the most suitable place for them. Mark this, and bore a hole in it with a fine brad-awl; now, get a needle-point or a tack with the head knocked off, insert it in this hole and give it a gentle tap; carefully press it home and it will mark the required spot. This method is more applicable where some part of the work acts as a support to the other, and you merely want a dowel or so to steady it, like a piece of carving or fret-work.

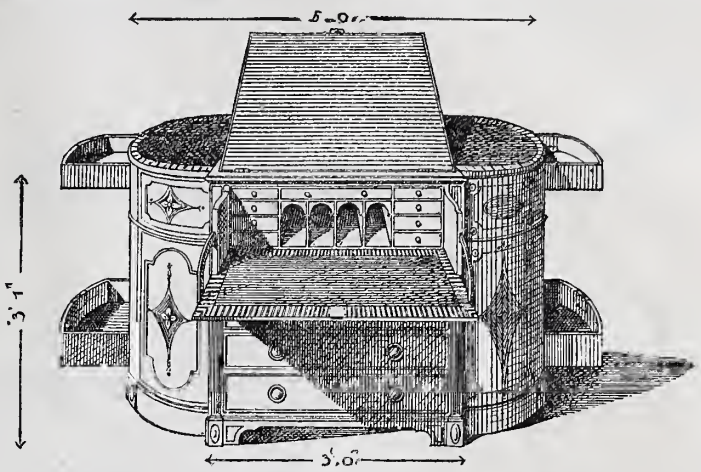



*Fig. 7.—Library Writing Cabinet and Secretary.*

Our points being now all marked, bore the holes with a center-bit the size of dowel you

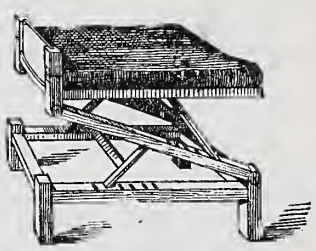


*Fig. 8.—A Gouty Stool.*

intend using. Do not use them too large. If you are doweling into ¾ inch or 1 inch stuff, use edgeways. A ¼ inch or ⅜ inch is quite large enough. If you have not one the same size use a smaller. You can then enlarge this with a quill-bit, and remove the core produced by boring with a nose-bit. Bore them perfectly upright. The depth will vary, according to circumstances, from ⅜ inch to

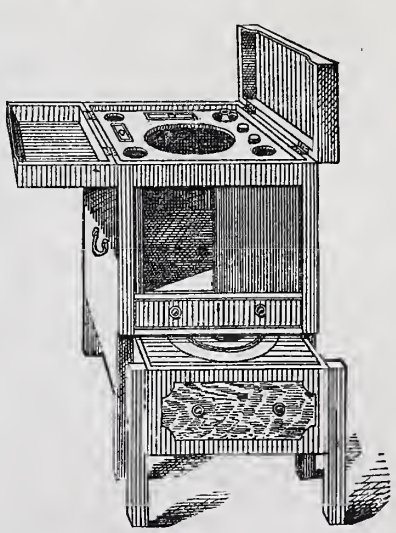
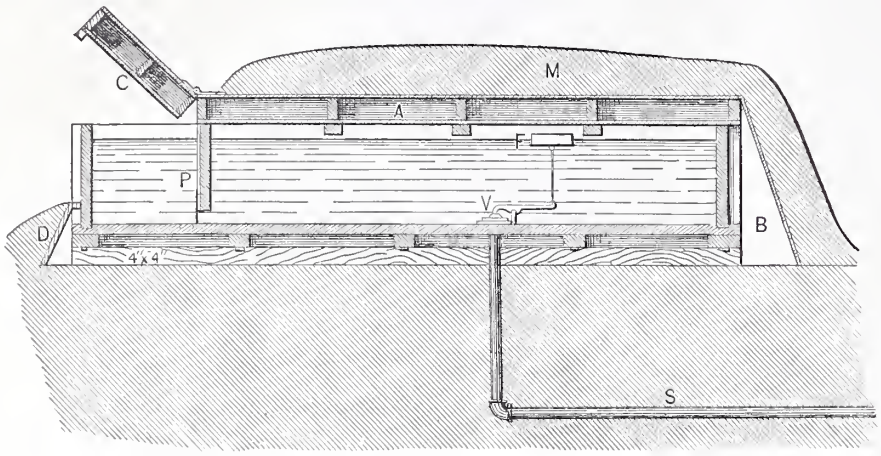


*Fig. 9.—A Night-Table Basin Stand.*

1 inch. In some cases it is immaterial how deep you bore; in others this must be carefully attended to, because a hole bored right through might disfigure your work. It is best to drive the dowels first into that part of the work where you can bore deepest. You must glue the holes well with good hot glue. You will find a piece of iron wire very

useful for this, and it can be used repeatedly, as the dried glue left on it after using will not adhere to the metallic surface. Now take your dowel length, and drive it into the hole until it is home and will go no further. You will notice while driving in that the glue and air will escape from that portion of the hole where the dowel, as previously described, does not quite fit. If this were not so, the driving force necessary would, in all probability, split the wood around. You must saw the lengths off now, leaving sufficient to fill the other holes you have bored. If you cannot judge the requisite length sufficiently accurate with your eye, measure it, and do not get them too long. After sawing off, remove all the edges and round the top of the dowel with a rasp. It is best just to try that the holes are right and the work in right position by knocking it on temporarily. If so, glue the holes and put the parts together, press them firmly down to each other, and get a close join. If you have any difficulty in this, it is better to apply gentle pressure by using a hand-screw or cramp to force them together than to strike them with a hammer or anything.




*Water Supply for Country Dwellings.—Fig. 1.—Frost-Proof Stock-Tank.*

## Water Supply for Country Dwellings.

BY A COUNTRY PLUMBER.

VII.

A frost-proof stock-tank is frequently wanted by farmers, at which stock may drink at their pleasure. The following illustration, Fig. 1, shows a good plan for arranging such. The tank rests on 4 x 4 inch sills, laid on the ground, S being the supply-pipe, V a float-valve, with lever, and F a float attached to same by copper wire, which automatically keeps the tank supplied from the storage cistern. At one end of the tank is a partition, P, running down within 2 inches of the bottom, put in to keep any floating matter from the main part of the tank and to prevent the circulation of cold air. It should be hinged to the bottom of the tank, to admit of entering to adjust or repair the valve or float. A double covering is made over the tank, forming a "dead" air space, as shown at A, and around it boards are set up edgewise, shown at B and D, forming an air space on all sides. The top and sides should be well covered with straw or manure, as shown at M. C is a double cover, which can be closed in winter when the stock have been watered. In warm weather this covering of straw and manure may be removed. In some sections of the country the hinged double cover would not be necessary.

Any number of such tanks may be supplied from an elevated storage tank or reservoir, and always kept full without running over by the use of valves and floats or tank regulators. They should be constructed of 2-inch lumber, well joined and securely clamped or bolted, and, before water is admitted, smeared inside with pitch to prevent leakage. A stop and waste-cock, similarly arranged to one shown in illustrations of a fountain, should be placed in the supply-pipe near the tank, by which the water may be shut off at any time.

Fig. 2 illustrates a plan for constructing a fountain. An excavation is made the size it is desired to have the ground basin outside, and about 3 feet deep. Around this is laid up a stone or hard brick wall, M, reaching about 2 inches above ground line. On this is a layer of brick two bricks wide, and on this a single layer, as shown at L. Cobble-stone and coarse gravel are filled inside of the wall, with fine gravel spread on top. The basin is finished with the best quality of hydraulic cement spread over the gravel, the supply-pipe S and waste-pipe W, with hose branch S, being first fitted to position, as shown. To form the coping or margin of the ground basin, make the former F, and pass it over pipe D, around which it revolves, and spread the cement uniform in shape over the two courses of brick. When this has become firm, the pedestal P may be built, with openings for the waste water to flow through waste-pipe W. Upon this the fountain proper rests.

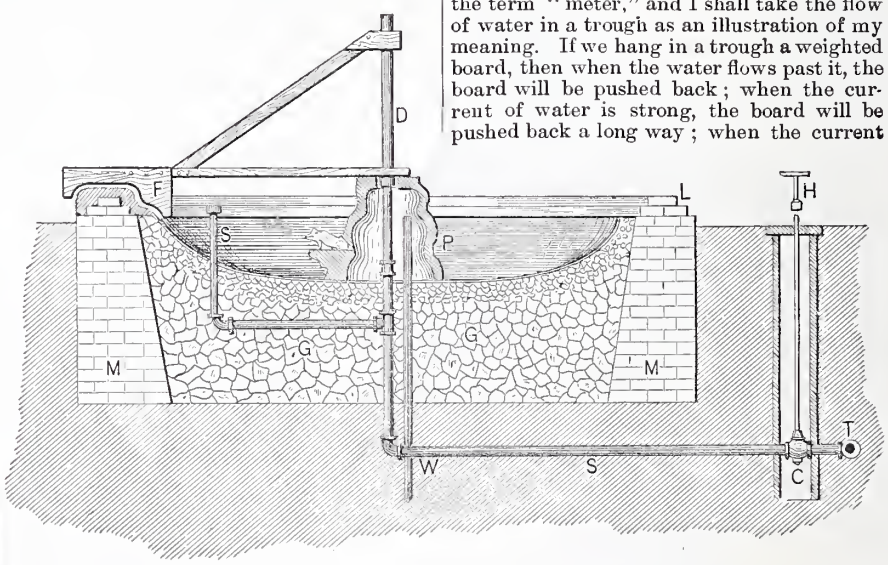



*Fig. 2.—Method of Constructing a Fountain.*

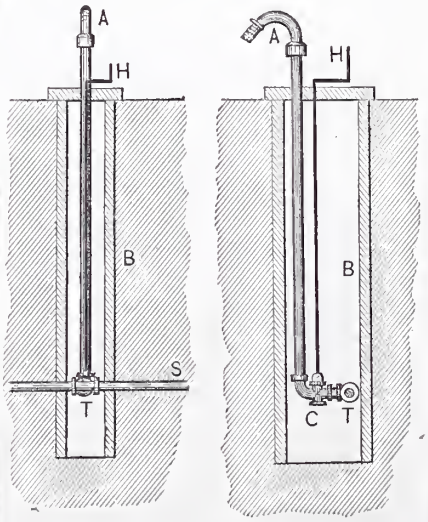



*Fig. 3.—Two Views of a Yard Hydrant.*

In Fig. 2, at C is shown a stop and waste-cock, with rod reaching above ground. By means of handle H the flow of water may be regulated. A box should be put down as shown at B, Fig. 3. The connection to distributing-pipe is shown at T. The waste-pipe W should discharge in a drain or be conducted to a stock-tank on lower ground. S in Fig. 2 is a hose branch, with cap, which may be removed and hose attached for sprinkling lawn or garden. In winter the basin and fountain should be entirely emptied and protected from frost by covering with straw and roofing.

Fig. 3 shows a very simple method of constructing a yard hydrant. S is the main distributing-pipe, laid below frost, with branch at T; C is a hydrant cock, with handle H reaching above the ground, inclosed in box B; A, cast crook, with hose-threads for connecting hose. The box should be constructed of suitable wood to resist decay. Such hydrants have the merit of cheapness. The box can be replaced when it has rotted away.

## An Explanation of the Term Meter.

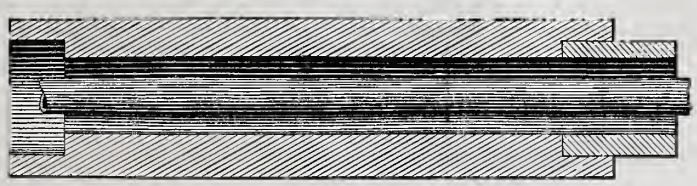
In a paper on "Meters for Power and Electricity" in the *Popular Science Monthly* for July, Mr. C. Vernon Boys says:

I shall at once explain what I mean by the term "meter," and I shall take the flow of water in a trough as an illustration of my meaning. If we hang in a trough a weighted board, then when the water flows past it, the board will be pushed back; when the current of water is strong, the board will be pushed back a long way; when the current is less, it will be pushed so far; when the water runs the other way, the board will be pushed the other way. So, by observing the position of the board, we can tell how strong the current of water is at any time. Now, suppose we wish to know, not how strong the current of water is at this time or that, but how much water has passed through the trough during any time, as, for instance, one hour. Then, if we have no better instrument than the weighted board, it will be necessary to observe its position continuously, to keep an exact record of the corresponding rates at which the water is passing, every minute, or better, every second, and to add up all the values obtained. This would, of course, be a very troublesome process. There is another kind of instrument which may be used to measure the flow of water—a paddle-wheel or screw. When the water is flowing rapidly, the wheel will turn rapidly; when slowly, the wheel will turn slowly, and when the water flows the other way, the wheel will turn the other way; so that, if we observe how fast the wheel is turning, we can tell how fast the water is flowing. If, now, we wish to know how much water altogether has passed through the trough, the number of turns of the wheel, which may be shown by a counter, will at once tell us. There are, therefore, in the case of water, two kinds of instruments, one which measures at a time, and the other during a time. The term meter should be confined to instruments of the second class only.

## CORRESPONDENCE.

### Conveying Steam Long Distances.

*From* Prof. R. C. Carpenter, *State Agricultural College, Lansing, Mich.*—In *Carpentry and Building* of recent date an answer was given to an inquiry from a correspondent signing himself J. H., which does not in all particulars agree with my experience. After careful examination and experimenting with a number of materials for covering steam-pipes, I have found that a tight wooden casing made from a pine log, having a shell of wood 4 inches thick and with an internal diameter 2 inches greater than that of the steam-pipe, gives the best result, so far as



*Conveying Steam Long Distances.—Fig. 1.—Longitudinal Section Through Pine Log Casing.*

protecting steam-pipes underground is concerned. Referring now to Fig. 1, the external shell is of wood, 4 inches thick. Next comes an air space of about 1½ inches, and then the iron pipe in the center. The pipe is held in the center of the wood by iron rings, with the edge of the inner circle quite thin, so as to offer but little resistance to the motion of the pipe from expansion. Fig. 2 of my sketches illustrates the rings for holding the pipe in place. The wooden pipes used are obtained from the Michigan Pipe Company, of Bay City. Fig. 4 shows a section through one of these pipe coverings, with a thimble at one end to be driven into a corresponding depression in another pipe. By this means a good joint, both air and water tight, is formed. These wooden pipes come in lengths of about 8 feet, and are slipped over the iron pipe nearly as fast as it is laid, and are driven together with a sledge-hammer. The depth underground at which such pipes are placed is immaterial, provided the pipes are properly laid. They should be so laid that the water will all drain out just as soon as the heat is turned off. This one thing alone may make the difference between success and failure. There is no need of being below the frost line. A depth of 2 feet will never suffer from frost, for the following reason: There is always some loss of heat, which, although a very small percentage, is in time sufficient to warm up the earth next to the pipe above the freezing point; when the steam is shut off, the heat in this earth will in turn prevent damage from freezing. With reference to the economy of this construction, I cannot claim that there is

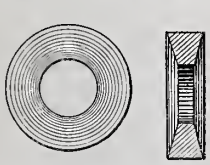


*Fig. 2.—Ring for Holding Steam Pipe in Place.*

no loss in transmitting steam a long distance, but I do claim that steam can be so transmitted with reasonable economy. The problem I had to do with was this: We had four large college buildings, with separate heating apparatus, making a large bill for firing. We erected a central boiler-house, from which we sent steam in one direction 900 feet and in the other 800 feet, having two buildings on each line. The return water can be made to empty directly to the boilers. We obtained better results, however, by keeping the boiler pressure at 35 pounds and reducing in the buildings to 5 pounds. This made it necessary to return the water of condensation to a hot well, and from this to pump it into the boilers. We are heating, under the above conditions, 516,000 cubic feet of space with from 2 to 3 tons of Ohio steam coal per day. We have 1 foot of heating surface in the boilers to each 234 cubic feet of space heated. We never find it necessary, however, to use more than three-quarters of the boiler capacity, which would make the necessary proportion of heating surface to space heated about 1 to 300. The durability of wooden pipe-covering is, of course, a question to be decided only by time. When put in well, however, and with the ends protected so as to prevent water from getting into the logs, there is not much doubt but that 25 years will be a minimum of its endurance.

A protection for underground steam-pipes will never be successful unless it is water-tight, which I deem the principal reason why wood pipe succeeds better than boxes filled with asbestos and other similar materials. Underground steam-heating systems have not usually been successful, for the reason that there has been want of attention to details, and in some cases on account of the use of pipe too small for the purpose. The question of expansion is one somewhat difficult to provide for. In long lines there must be expansion or slip joints, but in a line 120 feet in length the expansion can be provided for by elbows. If the pipes are laid so as to incline upward from the boiler, there will be a stream of water flowing in an opposite direction to the course of the

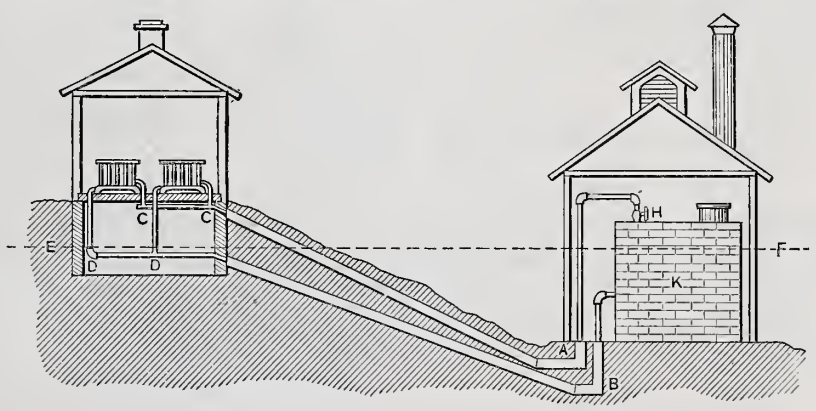



*Fig. 3.—Arrangement of Supply and Return Pipes Between Boiler House and Building to be Heated.*

live steam. To secure good results a large pipe must be used, say not less than 1½ inches diameter in cases of the character here cited. Means must also be provided for removing the water of condensation from the live-steam pipe at a point corresponding to A in Fig. 3. This is best done by small steam traps discharging into the return-pipe at B. In case the returns are connected directly with the boiler, the method of construction shown in Fig. 3 is one that will work well in cases of this kind here mentioned. A steam-pipe 1½ inches in diameter rises

*Fig. 4.—Cross-Section, Showing Pine Log Casing, Space and Steam Pipe.*

from the top of the boiler and extends around it, as at A. To the point the pipe should be protected with felt, asbestos or some other suitable material for the purposes. From point A the pipe should be laid in wooden casings of the kind described, of 3 inches internal diameter, as before mentioned. The return should be protected in the same way. If the return water is not needed, it may be allowed to escape, in which case it should be held back by a steam trap. The return needed for heating a room 25 x 25 in plan with 10 feet ceilings had better be of 1 inch diameter, although most fitters would use a pipe ¾ inch in diameter. The connection of the radiators, if more than one is employed, with the main return must be below the level of a line corresponding to E T in Fig. 4, which represents the water line of the boiler; otherwise live steam is likely to get into the return-pipe of the nearest radiator, and thus impede the circulation of steam in those further removed.

### Choice of Form in the Design of a Building.

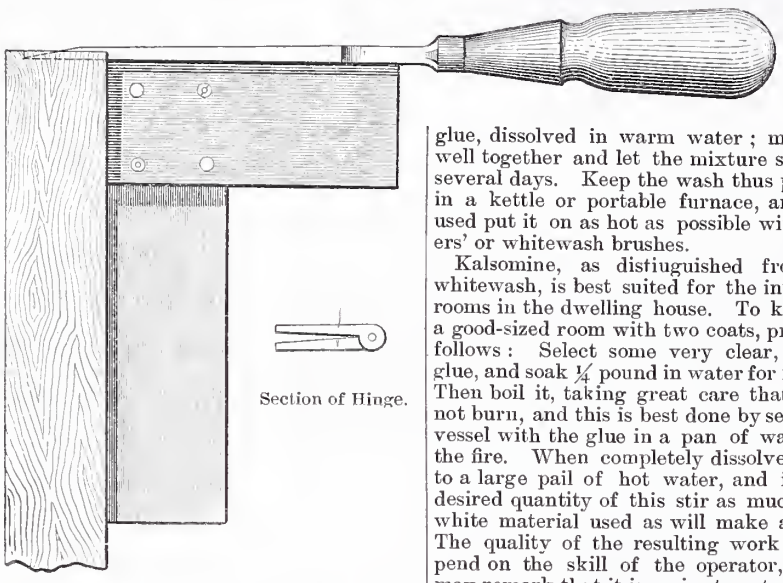
*From* E. C. B., *Winsted, Conn.*—I was very much interested in the letter on the above subject, from the correspondent, published in the August issue. Some of his ideas I indorse, but as he has the same fault, if it can be called a fault, for which he criticises others—namely, having his own ideas as to the "choice of form in design"—I will, with your permission, criticise him somewhat, and give my ideas, together with my rule for the choice of form, &c. In the first place, I would like to ask the correspondent if he thinks there is anything peculiarly moving or elastic about a parlor stove. Perhaps he has never tried to waltz one into position for winter use. Well, I have been through that performance, and I am prepared to say that there is not anything moving or elastic about it. After putting the stove up, I noticed that the legs were put on with the "large or base end upward." I was startled. They were evidently put in place for support, but they did not "carry a moving elastic weight" by a long shot. Then I tried to see if I could not find an analogy somewhere, and, as I was tired, I looked for a chair at the same time. To my surprise, I saw that the chair legs were made with the "large or base ends upward." And likewise the sofa and piano. I thought there must be an analogy somewhere still. There seemed to be a great deal of "stay"-bility to the stove—six months, at least—and the piano generally stays where it is put, and who ever saw a billiard table prance around. Everything seemed satisfactory in this respect, and all the subordinate parts were designed with reference to stability and elegance. But these were not animals, and so I could not see any analogy. Should there not be a reason or rule why this is thus? The correspondent "infers if." Probably the designer of the first-prize brick design "inferred if," and the designer of the columns with the "large or base end upward."

I will now give my rule, which I call a general rule. The subordinate parts of a design should be largest next to that from which they are a growth or of which they are parts. A stove leg is a part of the stove, not of the floor. The same applies to the piano or billiard table and all animals—their legs are a growth from the body; consequently, they are larger next to the body, not because they "carry a moving elastic weight." The same is true of the tree. It has a growth from the ground; and of the

limb, which has a growth from the trunk. As to columns for architectural work, by which I suppose the correspondent refers to veranda columns and turned work for sideboards, &c., such as are very commonly published, I ask, Is the column a part of the floor or of the roof, or is it an independent member? The columns answer the same purpose as the leg does for the piano or billiard table. It is to support the roof, and, consequently, is a part of it. When a column is a principal part of a building the large or base end should be downward, but for the subordinate parts I think it will be found that my rule will hold good.

### Hanging Doors.

*From* T. D. G., *Silver City, Iowa.*—The volume of *Carpentry and Building* for 1880 has some interesting stories with regard to door hanging. In hanging doors I first lay the doors on the tressels, with the cupping side down, and hang with that side in. I cut in the hinges as very clearly illustrated in my sketch, sent herewith. Doors managed in this way will swing correctly the first time.




*Hanging Doors.—Sketch Accompany Letter from T. D. G.*

### Whitewash.

*From* J. C. P., *Rushville, Ind.*—I desire some information with reference to kalsomining. I want to know what materials are used, what mixtures are best to employ and what colors are most satisfactory. An answer through the "Correspondence" department will greatly oblige.

*Answer.*—In response to our correspondent's inquiry, the following article, taken from a little book frequently referred to in these columns, and called "The Workshop Companion," will give the information he asks for and some besides:

The process of whitewashing is known by various names, such as "calcimining," "kalsomining," &c., most of them derived evidently from the Latin name for lime, which was the principal ingredient of all the older forms of whitewash. Professors of the "art of kalsomining" affect a great deal of mystery, but the process is very simple. It consists simply in making a whitewash with some neutral substance, which is made to adhere by means of size or glue. It contains no caustic material like lime. Several substances have been used with good results. The best is zinc white. It gives the most brilliant effect, but is the most expensive. The next is Paris white, or sulphate of baryta. This, when pure, is nearly equal to zinc white, but, unfortunately, common whiting is often sold for it, and more often mixed with it. It is not difficult, however, to detect common whiting either when alone or mixed with Paris white. When vinegar, or, better still, spirits of salt, is poured on whiting, it foams or effervesces, but if poured on Paris white no effect is produced. Good whiting, however, gives very fair results, and makes a far better finish than common lime as ordinarily used. When well made, however, good lime whitewash is very valuable for outhouses and places where it is desirable to introduce a certain degree of disinfecting action. One of the best recipes for lime whitewash is that known as the "White House" whitewash, and sometimes called "Treasuary Department" whitewash, from the fact that it is the recipe sent out by the Lighthouse Board of the Treasury Department. It has been found, by experience, to answer on wood, brick and stone nearly as well as oil paint, and is much cheaper. Slake ½ bushel unslaked lime with boiling water, keeping it covered during the process. Strain it and add a peck of salt, dissolved in warm water; 3 pounds ground rice, put in boiling water and boiled to a thin paste; ½ pound powdered Spanish whiting and 1 pound of clear glue, dissolved in warm water; mix these well together and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible with painters' or whitewash brushes.

Kalsomine, as distinguished from lime whitewash, is best suited for the interior of rooms in the dwelling house. To kalsomine a good-sized room with two coats, proceed as follows: Select some very clear, colorless glue, and soak ¼ pound in water for 12 hours. Then boil it, taking great care that it does not burn, and this is best done by setting the vessel with the glue in a pan of water over the fire. When completely dissolved, add it to a large pail of hot water, and into any desired quantity of this stir as much of the white material used as will make a cream. The quality of the resulting work will depend on the skill of the operator, but we may remark that it is easier to get a smooth hard finish by using threo coats of thin wash than by using one coat of thick. If you have time for but one coat, however, you must give it body enough. In giving more than one coat, let the last coat contain less glue than the preceding ones. Kalsomine such as we have described may be colored by means of any of the cheap coloring stuffs. The following is recommended as a good kalsomining fluid for walls: White glue, 1 pound; white zinc, 10 pounds; Paris white, 5 pounds; water, sufficient. Soak the glue over night in three quarts of water, then add as much water again, and heat on a water bath till the glue is dissolved. In another pail put the two powders, and pour on hot water, stirring all the time, until the liquid appears like thick milk. Mingle the two liquids together, stir thoroughly, and apply to the wall with a whitewash brush. It is often desirable to "kill" old whitewash, as it is called, as otherwise it would be impossible to get new whitewash or paper to stick to the walls. After scraping and washing off all loose material, give the walls a thorough washing with a solution of sulphate of zinc (2 ounces to 1 gallon of water). The lime will be changed to plaster of Paris, and the zinc will be converted into zinc white, and if a coat of kalsomine be now given it will adhere very strongly and have great body. We trust these directions will satisfy our correspondent.

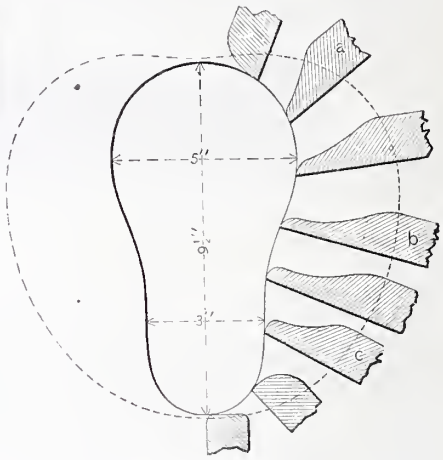
### Lead Roofing.

*From* W. A., *Montpelier.*—Will you please inform me, through *Carpentry and Building*, if you think lead roofs are likely to give as good satisfaction in this country as in England?

*Answer.*—We see no reason why lead roofs should not give the same satisfactiou in the United States as in England or on the Contiuent. Our climatic conditions are not so unlike those of other countries in which lead is extensively used as a roofing material as to make any great difference in the durability of the roofs. The only reason, so far as we know, that lead is not more extensively employed in this country, is that its first cost is high in comparison with many other materials for roofing purposes. The little lead roofing that has been done here in recent years has had small chance of giving satisfaction, both on account of the inexperience of the workmen who have laid it and from the fact that material of too light a gauge has been employed. With the large number of cheap roofing materials available in this country, we believe lead is not likely to obtain any considerable foothold.

### Form of Water-Closet Seats.

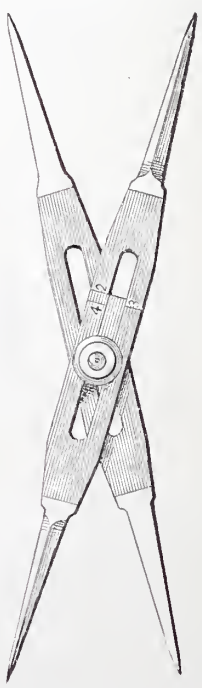
*From* J. C. R., *Mount Vernon, N. Y.*—I inclose a diagram of an improved form of opening for privy seats, which may be of interest to those readers of *Carpentry and Building* who have occasion to execute work of this kind. This form is in accordauce with a very common anatomy, and is a preventive of pelvic deformities and other serious consequences inseparable from seats constructed in the usual manner. Withal, it is more comfortable than heretofore attainable. After the reader's mind shall have been disabused of the cart-wheel idea, he will have no difficulty in understanding the sketch.




*Form of Water-Closet Seats.*

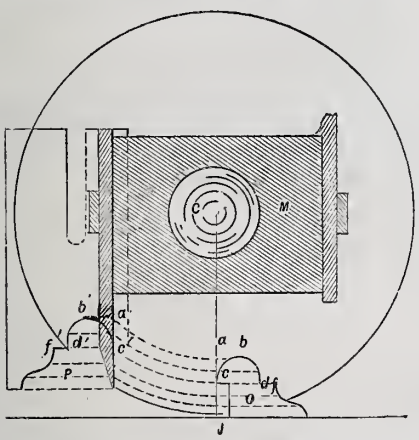
### Proportional Dividers for Laying Out Molding Knives.

*From* W. K. G, *New York.*—I have read with interest the articles which have appeared from time to time on the method of marking out the knives for molding machines. In the July number of *Carpentry and Building* I notice au instrument for accomplishiug this object, which, while it may be very nice, seems to me to be much



*Proportional Dividers for Laying Off Molding Knives.—Fig.* 1.

more complicated than is necessary. From observations on all the diagrams I have seen published on the subject, I observe that as the angle of the knife to the work varies for each different size of cutter head, it follows that the outline of the knife is a greater or less elongation of the profile of the molding to be made. Taking this view of the subject, it seems to me that the only thing to be done is to determine what proportion the hight of outline of the knife for a 2, 3 or 4 inch head bears to the original profile, and then to construct a pair of proportional dividers after the ordinary fashion—except that the divisions should indicate the size of the head, as I have shown in the accompanying sketch, instead of quarters, halves, thirds, &c. Supposing, now, I wish to mark the outlines of a knife for a 3-inch head, I have only to set the thumb-screw to the figure 3, and then




*Proportional Dividers for Laying Off Molding Knives.—Fig. 2.—Showing Cutting Angle at Various Points of Knife.*

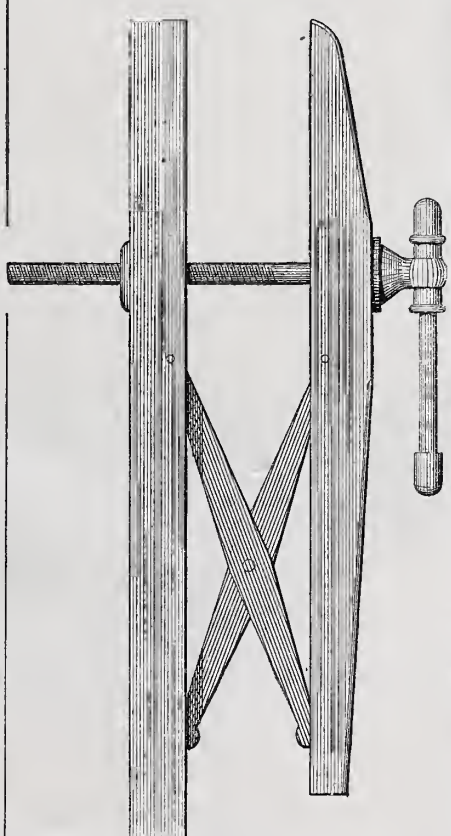
measure the hight of any number of the molding with the short end of the dividers; the other end will then give me the required hight of that number on the knife.

*Answer.*— Our correspondent's device, which is represented in Fig. 1, has the appearance of plausibility, and, judging from the number and character of the inquiries that we have received, there may, perhaps, be many among our readers who would not discover its error. The present instance affords us the opportunity to say that the principle which underlies all the methods which have appeared in our columns for describing the outlines of molding knives is the same. In other words, that all methods which produce correct results are but different ways of applying the same principle, and that this principle, being thoroughly understood, at once determines the correctness or error of any method that may be offered. Before this principle can be thoroughly comprehended it will be necessary for the beginner to construct a diagram with his square and compasses. It is sometimes asserted that the person whose business it is to do work of this character is not ordinarily a draftsman, and, therefore, is not accustomed to making patterns on paper first, but produces them at once in the metal. Be this as it may, any one who will devote an hour's study to the subject with pencil, square and compasses as assistants, may become master of the problem and be able to produce correctly, by any means he sees fit to employ, the knife to cut any given profile.

By inspection of Fig. 2, taken from a previous issue of *Carpentry and Building*, it will be seen that while the knife is placed at such an angle to the molding as to do its work best, all points of the knife do not cut at the same angle—that is, each point in hight of the knife takes its deepest cut when it is below the center of the cutter-head. When the lowest point of the knife is doing its work the highest and all intermediate points have not yet reached their lowest cut, and when the highest point is taking its cut the lowest point has raised some distance. If the knife is stopped in the position shown in Fig. 2, and circular lines are drawn from the vertical line through the center, cutting the knife, as shown dotted in engraving, it will be seen that each line meets the knife at a different angle, which represents the cutting angle of the part of the knife it intersects. If these lines were straight instead of circular, and were cut by an oblique line representing the knife, then the angle of intersection would be the same in all parts of the profile, and hence the whole hight of the profile would be to the whole hight of its outline on the knife as the hight of any part of the profile would be to the hight of the same part upon the outline of knife. Were this the case our correspondent's device would be perfectly correct. But since these lines are curved instead of straight, the knife meets every part of the profile at a different angle, and the above proportion cannot exist. Hence our correspondent's device, although very ingenious, is, unfortunately, incorrect.

### Carpenters' Vises.

*From* M. L. G., *Atlanta, Ga.*—Several articles on vises have lately been published, with illustrations, but so far I have seen nothing as practical or as good as a construction I have been using for, perhaps, a dozen years. It is a parallel vise, easily constructed. According to my understanding, a man by the name of Vose, of Springfield, Mass., was the originator of the idea, but he never patented it, nor did he attempt to obtain a patent on it. Both jaws of the vise are grooved out for the irons. The



*Carpenters' Vises.—Fig. 1.—Side Elevation.*

upper ends of the irons are fastened loosely with a pin through the jaws. The lower ends play in the grooves loosely, and where they cross they are riveted together. This construction causes them to hold the weight of the jaw and of the screw. The lower end of the flange of the jaw should be further back than the top. The grooves should be ⅝ inch deep and 1⅛ inches wide, which is the thickness of the two irons. The irons are alike. I hope that this explanation, in connection with the accompanying sketches, will enable the readers of *Carpentry and Building* to understand the construction.

### Curved Mansard Roofs.

*From* C. P. K., *Bigler, Pa.*—I am about putting up a building with a mansard roof. As I have not noticed anything in the numbers of *Carpentry and Building* during the present year relating to roofs of this kind, I desire some special information. First, what is the customary pitch where roofs of this kind are concave at the bottom and 7 feet high. Second, how are slate put on the concave part of roofs? Are concave slate employed, or are they laid diagonal, with the upper corner clipped off? I have laid plain slate roofs, but have not noticed how slate are laid on concave roofs. I am a practical

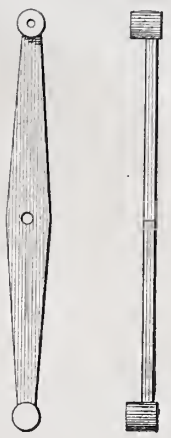


*Fig. 2.—Detail of Spreading Device.*

carpenter and builder, and have derived many useful ideas from the paper.

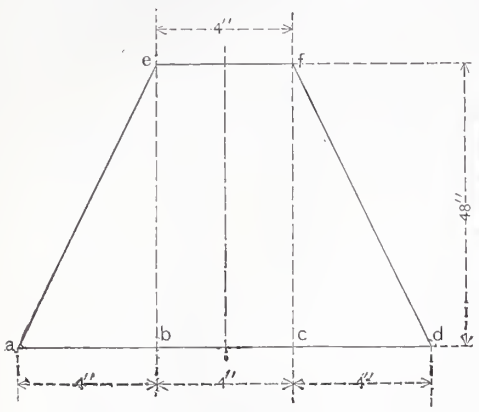
*Answer.*—In response to our correspondent's first inquiry we call his attention, at the outset, to the fact that a curved mansard roof, in the estimation of many designers and constructors, is in very bad taste both in point of form and on account of construction. He has experienced some of the difficulties of construction already, as is evidenced by the account which follows his first question. Referring to this inquiry, as a practical carpenter and builder our correspondent should know that there is no fixed rule in proportioning parts of buildings or determining the pitches of roofs. While there are certain customs in matters of this kind sanctioned by long usage, there is no one who can say "this is right," or that "the other is wrong," without the fear of contradiction. The hight that our correspondent names for his mansard roof is very small, unless the building is a low structure. Consultation with some good architect who can take into account the site of the building, the hight of stories and its general shape or plan would be of much more service than any directions we might give from the meager knowledge of the requirements furnished by his letter. We have anticipated the answer to the second question in remarking that a curved mansard roof is in bad taste on account of constructive features. A roof is primarily for the purpose of shedding water, and no treatment of it for the sake of ornamentation or embellishment should be allowed to interfere with the purpose for which it is intended. Curving the rafters makes it practically impossible to cover it satisfactorily with such material as slate, and difficulties almost as great will be encountered in using shingles, tin or sheet iron. The best plan that suggests itself at present, if a roof of this kind is to be em-

*Fig. 3.—Inside of Jaw.*

ployed, is the use of very small slate. We suggest to our correspondent, if he has not progressed too far in his plans, that it would be well to reconsider the design, to the end that a roof easier of construction and more satisfactory for use may be employed.

### Center of Gravity of Solids.

*From* C., *Philadelphia.*—Your correspondent, John C. Rankiue, New York, in his answer to W. H. B., in the October number,




*Center of Gravity of Solids.—Fig. 1.—First Demonstration.*

seems to be somewhat mixed. He says: "Obviously the center of gravity of a surface, so to speak, will be at the middle of a straight line drawn across the board parallel with the ends, which shall divide it into two parts of equal surface," &c. This is obviously not true for the case he is considering, since the area moments about the line or axis through the center of gravity must in all cases be equal, which, in his example, will require the area of the upper section to be 177⅓ square inches, and that of the lower section 206⅔ square inches. Total area = 384 square inches.

Further in his calculation

"$\sqrt{\text{ar. B C F } (\frac{1}{2} \text{ ar. A B C D} + \text{ar. A D F})}$" is equal to $\sqrt{25{,}920} = 160.997$, not "160."

The fourth term of the proportion of which the above is the third is 4.472, not "4.444 +."

The value of the fraction

$$\frac{\text{"}\frac{1}{2} \text{ ar. A B C D"}}{\text{Div. line } 4.444 +}$$

is 21.6 inches, not "18.4 —."

The distance of the center of gravity "B G" above the base line "C B" is 20 inches, not "18.4 inches."

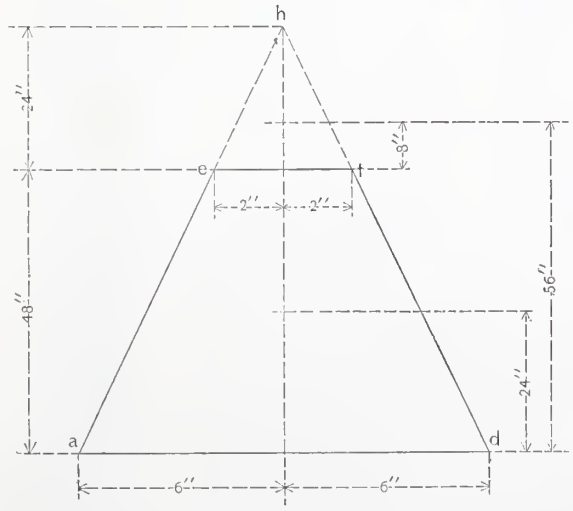



*Fig. 2.—Diagram Illustrating Second Method.*

Area of $a\ b\ c$ or $c\ d\ f$ is $\frac{48 \times 4}{2} = 96$,

their sum..... = 192
Area $b\ c\ e\ f = 48 \times 4$..... = 192

Total area..... 384

Now, since the center of gravity of a triangle is at a distance of one-third of its perpendicular hight above its base, the center of gravity, the triangle $a\ b\ c$ or $c\ d\ f$ is 16 inches above $a\ d$, and the center of gravity $b\ c\ e\ f$, being at one-half its hight, is 24 inches above the same line.

Taking moments about $a\ d$ we have:

For the triangles, 2 (96 × 16) =..... 3072
For the parallelogram, 192 × 24 =... 4608

Sum of the area moments =..... 7680

Dividing this sum by the area of $a\ d\ e\ f$ will give the perpendicular distance of the center of gravity of $a\ d\ e\ f$ above the base $a\ d = \frac{7680}{384} = 20$ inches.

Another method: Center of gravity of triangle $a\ d\ h$, Fig. 2, is 24 inches above $a\ d$, and of triangle $e\ f\ h$, 56 inches above the same line. Area of $a\ d\ h = 432$; $e\ f\ h = 48$ and $a\ d\ e\ f = 384$. Now, the difference of the area moments of the two triangles about $a\ d$, divided by the area $a\ d\ e\ f$, will give the distance of the center of gravity of $a\ d\ e\ f$ above $a\ d$; thus,

$$\begin{aligned} 432 \times 24 &= 10{,}368 \\ 48 \times 56 &= 2{,}688 \\ \text{Difference of area moments} &= 7{,}680 \end{aligned}$$

and $\frac{7680}{384} = 20$ inches, as before.

A graphical method applicable to any trapezoid, whether regular or irregular, is as follows: In Fig. 3, bisect the parallel sides $e\ f$ and $a\ d$ in $i$ and $k$ and draw $i\ k$. Prolong $e\ f$ on one side until $e\ l$ is equal to $a\ d$, and prolong $a\ d$ on the other side until $d\ m$ is equal to $e\ f$. Join $l\ m$, and the point $g$, at which it intersects $i\ k$, is the center of gravity of the trapezoid. In this case, as the trapezoid is regular (the lines $a\ e$ and $d\ f$ making equal angles with $a\ d$), produce $a\ d$ to $n$, and draw $l\ n$ perpendicular to $n\ d$; $l\ n$ will be parallel to $i\ k$. Then from the similar triangles $l\ m\ n$ and $g\ k\ m$ we have $m\ n : l\ n :: k\ m : g\ k$, or $g\ k = \frac{l\ n \times k\ m}{m\ n} = \frac{48 \times 10}{24} =$ 20 inches, as before.

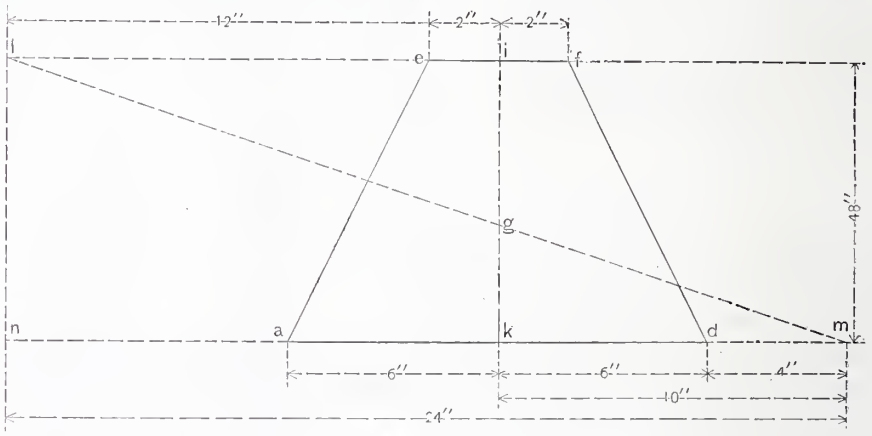



*Fig. 3.—A Graphical Method Applicable to Any Solid.*

### Cemetery and Well.

*From* S. W. S., *Statesville, N. C.*—Will you please give me your opinion as to whether a cemetery affects the water in a well 270 feet distant. The surface water runs in a direction away from the well. The surface of the earth at the well is 8 feet lower than at the corner of the cemetery, and a spring and brook on the right is 30 feet lower.

*Answer.*—We cannot answer this question definitely. Indeed, without an inspection of the ground or some knowledge as to how the underlying strata inclines, an opinion would be of comparatively little value. One thing is certain, however, that the well is not so far away but what we might expect the drainage of the cemetery to gradually work into it. This might be the case, especially if the well is deep. One tolerably satisfactory test would be to empty a gallon of kerosene in this cemetery or put it into a hole in the ground at a point nearest to the well. If the drainage is in the direction of the well the kerosene will very shortly make its presence felt.

### Bulging Walls.

*From* S. J. B., *Menomonee, Wis.*—I notice in the November number of *Carpentry and Building* a letter from W. S. W., of Windsor, Mo., asking advice in regard to the walls of a warehouse constructed there. His question is so incomplete as to be unanswerable. How does he know the walls have settled, simply because they have sprung or are out of plumb? Do they incline out or in? Is it one or both walls, and do they both incline the same way? It is no uncommon thing to spring green brick wall by putting on joist, and it is frequently done by incompetent carpenters, who have worked at the trade even 20 years, for some men will never learn to be careful. I have had more trouble with carpenters on brick buildings than any other class of workmen. For instance, they will take up a full set of joists and lay them down flat on the wall before setting and stay-lathing. A joist 22 feet long laid down flat will spring down and draw on the walls. Another will draw a little more and hold all it draws, and so on, until I have seen walls 16 inches thick, 13 feet high and 80 feet long drawn in 2 or 3 inches. Especially will this be the case if there are a number of openings on the sides.

I frequently build a bond plank in the wall and spike a plank to it and on the joist below, particularly if it is an open front. I put them every 15 or 20 feet, and leave them until the joists are on, and sometimes until I am ready to finish inside, as a precaution, not only against carpenters, but storms. Sometimes, when run planks are used, the tramp of hod-carriers will make the walls vibrate. I learned by years of practice that an ounce of prevention is better than a pound of cure. I find that but few ordinary carpenters are worth much on a brick building during the building of it. They may be all right on a wooden building, and yet all at sea on a brick one. It is a pleasure to have a good carpenter about a brick building; one who knows what to do, and who does it at the proper time; one who can get in and set a frame without all the crew of bricklayers stopping work. The trouble with W. S. W.'s walls may be bad foundation or bad mason work. I doubt if a good job can be made of it now, unless all is built anew.

### Phillips's Plow.

*From* A. W. E., *Brockton, N. Y.*—I will be obliged if you can inform me where I can obtain the Phillips plow. It is a tool that I like better than any other which I have yet seen. The goods were formerly sold in Boston, but letters sent to the old address remain unanswered.

*Answer.*—We have made careful inquiry with reference to this tool in the New York market, and are informed that it is no longer manufactured. It is possible that some of our readers may know of a supply from which our correspondent can obtain what he desires. If so, we shall be glad to hear from them.

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